The Builder.

VOL. LXXVIII., No. 2986. APRIL 28, 1900.

ILLUSTRATIONS.

Stables and Farm Buildings, Wickham Hall, Kent.—Messrs. Millard & Pryce, Architects ..... *Double-Page Ink-Photo.*
Glasgow University Extension: New Botanical Laboratories.—Messrs. J. Oldrid Scott and J. J. Burnet, Joint Architects.. *Double-Page Photo-Litho.*
The Colonnade, Hampton Court Palace.—Measured and Drawn by Mr. Philip J. Turner ..... *Two Double-Page Photo-Lithos.*

Blocks in Text.

House, Mount Pleasant, Tunbridge Wells. Mr. C. H. Strange, A.R.I.B.A., Architect ..... Page 420
Cricket Pavilion, Nevill Ground, Tunbridge Wells. Mr. C. H. Strange, A.R.I.B.A., Architect ..... „ 421
Stables, Wickham Hall, Kent. Plan ..... Page 422
Illustrations to Student's Column ..... „ 425
Fixing Woodwork to Walls ..... „ 428

CONTENTS

Fireproof Construction 413
Notes 416
The New Gallery Exhibition 417
The Royal Institute of British Architects 418
Competitions 419
House, Mount Pleasant, Tunbridge Wells 420
Architectural Societies 420
Metropolitan Asylums Board 420
Cricket Pavilion, Nevill Ground, Tunbridge Wells 421
Applications under the 1894 Building Act 421
Illustrations :—
Stables and Farm Buildings, Wickham Hall, Kent 422
Botanical Laboratories, Glasgow University 422
Wren's Colonnade, Hampton Court Palace 422
Working Rules for Carpenters and Joiners in the London District 423
Correspondence :—
Labour in the Building Trade 423
Penalties for Unfinished Contract 423
Books: W. S. Calverley's "Notes on the Early Sculptured Crosses, Shrines and Monuments in the Diocese of Carlisle"; Lewis F. Day's "Art in Needlework: a Book About Embroidery"; Louis Edgar Andes' "Iron Corrosion: Anti-Fouling and Anti-Corrosive Paints"; W. Young's "Spons' Architects and Builders' Price Book, with Useful Memoranda and Tables" 423
The Student's Column.—Details of Structural Iron and Steel 424
Books Received 426
Obituary 426
General Building News 427
Sanitary and Engineering News 427
Foreign 427
Miscellaneous 427
Capital and Labour 429
Legal :—
Point under the London Building Act, 1894 428
Recent Patents 428
Meetings 429
Some Recent Sales of Property 429
Prices Current of Materials 429
Competitions, Contracts, and Public Appointments 430
Tenders 431

Fireproof Construction.

ALTHOUGH architects in this country are fully alive to the importance of, and necessity for, fireproof construction, very little interest with regard to the subject is evinced by the general body of the public. This apathetic attitude undoubtedly constitutes the most adverse influence against which the advocates of rational and scientific building construction have to contend. Considering the immense numbers of dwelling houses and other buildings existing in our great cities, and the extremely inflammable nature of their constituent parts and of their contents, it seems wonderful that the percentage of fires remains so small. The very fact that the chance of fire in any individual case is very remote seems sufficient to reconcile the average householder or occupier to existing conditions. Capitalists, again, who are financially interested in building operations, are not always ready to spend money in directions which do not promise adequate return, and in certain classes of property it would be difficult to increase the present ratio of rent to accommodation simply by the offer of what is apparently considered to be so intangible an advantage as additional security of life and property. There are, of course, numerous instances where fireproof construction is recognised as an absolutely essential factor, but these probably form a small percentage of the whole amount of building works conducted throughout the country. Admitting the accuracy of the view that fireproof construction is not likely to be extensively demanded by the popular voice, it becomes evident that legislative enactments are required in order that the system may become compulsory in the case of all new buildings, and of all important alterations to existing structures. But beyond these considerations lies the fact that fireproofing methods have not entirely emerged from the chrysalis state of experimentation. Architects may be agreed as to the desirability of improvements, but their opinions differ in many essential points as to the exact manner in which admittedly needed reforms are to be effected. We have recently directed attention to the admirable work performed by the British Fire Prevention Committee, and in the same issue reference was made to the paper by Mr. Blashill on "The Architect in Relation to Fire Prevention." It was pointed out by the author, and by several well-known architects taking part in the discussion, that many impediments existed tending to render difficult the progress of improvements in respect of fire-resisting construction. Legal requirements were admitted to be lamentably insufficient, and especially so far as they related to old buildings and to roof construction generally. The provisions of the Building Act of 1894 with regard to roofs appear to recognise that danger may approach a building from the outside, for they stipulate that roofs should be covered with slate, tiles, or other incombustible material; but except in the case of buildings including "any story constructed in the roof at a height of 60 ft. from the street level," no demand is made for other than the ordinary combustible roof, which is so undeservedly popular, and there is little or nothing expressed in the Act leading to the inference that internal sources of danger have been adequately realised. Unfortunately, similar criticism may occasionally be directed against the professional architect, who sometimes exhibits the same difficulty in appreciating the undesirable nature of ordinary roof construction.

Another matter not yet grasped by the legislative mind, and seldom sufficiently considered by the average architect, is the protection of structural iron and steel from the influence of fire. We fear the pious belief is still far too prevalent that these metals may be considered to be fireproof because they are incombustible. True it is that they may be usefully applied in some details for holding back or keeping out flames during the progress of a fire, but in an unprotected state they must not be relied upon for the support of floors and roofs except at normal temperatures. One has only to look at numerous important public buildings in the metropolis in order to realise the amazing disregard evinced in the past as to the collapsing points of iron and steel when exposed to heat. And even now there is no clear indication that these simple data are universally considered to be essential factors.

When we find that buildings of national importance, such as the new Record Office and the new Admiralty, are provided with roofs in which the iron construction is not enclosed, and is protected merely by a fireproof ceiling, it can be no matter for surprise if structures erected under less august direction do not fully comply with reasonable safeguards.

In our previous article we pointed out the inadequacy of so-called fire-resisting floors, constructed in accordance with the London Building Act, and our correspondence columns have further evidenced the confusion prevalent as to proper interpretation of existing regulations. These things are merely typical of the official status of fireproof construction, which now in its beginning is "without form and void." Perhaps order may take the place of chaos at no distant date, but this desirable consummation will not be arrived at by any system of spontaneous evolution, and will be achieved solely by continued effort and hard work.

In Great Britain we are probably less advanced in fireproof construction than are many continental nations, but this distinction is one constituting another bond of sympathy between our own country and the United States. As a matter of fact, intelligent Americans already recognise their deficiencies, and the greater immunity of British buildings from destruction by fire is freely admitted. At the same time, it ought to be known that, having seen the evils attendant upon ordinary systems of construction, our American cousins are now promptly taking measures for the purpose of preventing the perpetuation of condemned methods. This course of action is all the more

necessary because of the change of form which has been evinced by the typical American building. Only a generation or so back the popular imagination pictured America as a country in which Indians, backwoods, and one-storied log-houses were prominent features. In the present day a new vision is presented, where Indians and backwoods are displaced by populous cities and endless railroad tracks, whilst the wooden homestead is crowded out by gaunt erections of the "sky-scraping" order. It is quite true of large cities that tall buildings are becoming increasingly popular, but American architecture should not be supposed to exist solely for the production of such monstrosities. Even if this were the case, the value of fireproofing systems would be increased rather than minimised, and we may therefore derive advantage from the comparison of our own methods with those constituting the most modern practice in the United States.

A recent publication on this subject* seems to present a useful summary of the most efficient methods of treatment as recommended and used in the best practice of the day, and the author hopes it may rouse "more general interest in a phase of building construction, the full importance of which from an economic standpoint and from its close relation to the safety of human life, still largely remains to be realised in a practical and adequate way." At the outset, it may be remarked that Mr. Freitag admits the number of fires and the percentage of values destroyed by fire in the United States to be greater than those in Europe, and he accounts for this state of things by citing the better methods of construction generally prevalent in Europe. This opinion is confirmed by the United States Consular reports issued in 1892 by the State Department at Washington at the instance of the National Board Committee on Statistics; and it may be added that in Leeds, Sheffield, Bristol, Newcastle, Rome, Florence, Turin, Brussels, Antwerp, Havre, Copenhagen, and Trieste, every fire during 1899 was confined to the building in which it originated. Similarly satisfactory results have not been experienced in the United States, where fires are frequent and losses are heavy, the losses by insurance companies and the public in the United States amounting in 1893 to thirty-three million sterling.

In commenting upon the conditions indicated by such heavy losses, Mr. Freitag remarks "Our fire losses cannot be met by the simple provision of insurance. Insurance is only a means whereby the community bears the loss of the individual. It is a palliative for the evil, not a cure. Nor is it possible to effect a change simply by increasing the rates of insurance. The insured must co-operate with the underwriters in bringing about a better class of building construction, and this will obtain as soon as the individual realises what proportion of a reckless waste he is made to bear."

These sentiments are worthy of notice, if only for the purpose of showing how nearly they represent professional feeling on this side of the Atlantic. Further, we are glad to observe that due recognition is made of the work undertaken by the British Fire Prevention Committee, whose publications are regarded as being "of the utmost value to all who are interested in the development of this subject." We will pass by the preliminary chapters of the volume under notice, for their chief interest is not so much practical as historical.

The next section is devoted to the subject of fires in fireproof buildings, and in it are given particulars of several well-known fires, with details as to the origin and extent of each, as well as the nature of the structural defects which permitted the flames to gain a hold upon the building, and helped to accentuate the damage in other directions. Information of this kind is even more valuable than the most carefully-devised artificial tests, and we have therefore condensed the net results in the following table:—

Table I.—Examples of Fires in the United States.

Date.	Name.	Kind of Construction.	Origin of Fire.	Result.	Remarks.
1895	Manhattan Savings Bank, N.Y.	So-called "fireproof."	Exposure fire from another building.	Exposed ironwork expanded, forcing beams from their supports. Roofs, floors, and columns fell.	Buildings of brick and pine have more chance of being saved than fireproof buildings of this kind.
1891	Lumber Exchange Building, Minneapolis (eleven stories).	*Old part* (nine lower stories), slow-burning construction, iron columns, iron girders, wood joists, cased terra-cotta.	—	Burned twenty-four hours, only walls and iron columns left, supporting upper stories.	
		New part (two upper stories), best fireproof construction, steel frame and floor beams, hollow tile floor arches.	—	Withstood fire without serious injury from fire or water.	
	Building near Schiller Theatre, Chicago.	Non-fireproof. Iron frame, wall covered with vitrified tiles, windows not protected by shutters.	Flames from Schiller theatre fire, 30 ft. distant, entered through windows.	Outer faces of wall tiles fell off, exposing iron frame. Brick walls not damaged.	Shows the unreliable character of tiles and the danger of unprotected windows.
	Building near Opera House, Detroit.	Steel frame building, side curtain-walls of tile.	Flames entered from Opera House fire.	Wall tiles off in large quantities.	Another example indicating the disadvantage of tiled walls.
1892	Athletic Club Building, Chicago (nine stories).	Steel frame fireproof building, self-supporting walls, terra-cotta floor arches, columns and partitions protected by terra-cotta.	—	Floor beams twisted. Steel columns bent. Column protection broke. Undersides of fire blocks fell off. Little injury to metal. Building not endangered.	Tile partitions much damaged by water. Air spaces in ceilings and wainscotting aided fire. Too much wood in floors. Column partitions of bad design, and included nailing strips, which burnt out and caused fall of terra-cotta. Fireproofing not properly bonded.
1897	Pittsburg Fire: (*a*) Jenkins Building.	Entirely of wood, but had iron shutters to windows.	In this building.	Completely destroyed.	Shutters proved of value in retarding spread of fire.
	(*b*) Horne's Store Building (six stories).	Fire-proof, steel columns and floor framing, tile and concrete floors, roof not fireproof, window shutters of wood, covered with tin.	Flames entered through windows from (*a*) 60 ft. distant.	Contents burnt. Tank on roof fell. Steel work damaged to extent of 20 per cent. (of which 15 per cent. was due to tank). Tile floors little damaged.	Tank supported by beams resting on roof girders, which were only protected by a ceiling. Heat caused collapse. Wood look-outs for heavy cornice instead of steel brackets. Fire acted as annealing furnace and improved quality of steel members.
	(*c*) Horne's Offices (four stories).	Fireproof construction, but no shutters to windows.	Entered through windows from (*a*) 60 ft. distant.	All combustible material destroyed. Steel work, arches, and column covers, all good.	Damage largely due to wood strips for base boards. Shows necessity for shutters.
	(*d*) Methodist Building (eight stories).	Fireproof construction.	Entered from (*a*) 20 ft. distant.	Contents burnt, but iron and concrete good. Only part of woodwork destroyed.	Wood partitions covered with plaster proved very unsatisfactory.
1898	Livingtone Building, New York (eight stories).	Fireproof construction. Partitions, 2 in. metal studs, expanded metal and plaster, doors and frames of wood, sheet-iron, and asbestos; iron window shutters.	Originated on fourth floor.	Contents of fourth floor burnt; fifth and sixth floors damaged by water. Structural damage very slight.	If windows protected there is little danger of fire spreading to other floors. Metal-sheathed doors and metal partitions proved valuable.
1898	Vanderbilt Building, New York (fifteen stories).	Fireproof construction; iron shutters to windows.	Exposure fire from another building 40 ft. distant.	Damage confined to wood, plaster, and contents.	None of the window shutters were closed. Difficulty occurred in getting hose up the stairs, owing to unsuitable design.
1898	Home Insurance Building (fifteen stories).	Fireproof construction; top flanges of girders exposed and no window shutters.	Fire entered through windows from adjacent building of five stories.	Damage chiefly from eleventh floor up. Structural injury slight; floor arches stood well, but one broken through falling of a safe. Part of a floor arch on fifteenth floor fell owing to deflection of an exposed girder.	Demonstrates the necessity for window shutters and value of fireproof construction. Space under safe should have been concrete instead of boards with air space beneath. All girders must be protected. Burning of wooden doors and partitions did great damage.

We commend the foregoing statement to the careful consideration of our readers, more especially for the reasons that fireproofing has hitherto been more or less academic and theoretical as to its nature, and that many important practical questions still remain open. The answers are to be found in actual fires, of which there have been comparatively few in modern fireproof buildings worthy of the name. Fireproof construction, even of the most approved description, is only relatively valuable, for we know that buildings in which

* "The Fireproofing of Steel Buildings," by J. K. Freitag, C.E. John Wiley & Sons, New York; Chapman & Hall, Limited, London. 1899.

originating fires would find little encouragement may easily be damaged, if not destroyed, by flames from adjacent or contiguous premises. Therefore the full value of modern methods will only be realised when the day of fireproof cities and towns has dawned. In the meantime much may be done by the protection of windows so that fire may not readily enter from without; by the use of incombustible floors, partitions, and roofs so that fire may not be encouraged within; and by the protection of all iron and steel members so that the collapse of incombustible members may be averted.

After dealing with actual fires, Mr. Freitag proceeds to consider the essential characteristics of an acceptable fireproof floor, and these he expresses in the following terms :—

Strength and rigidity under static and moving loads.

Ability to resist shock due to falling bodies.

Permanency under ordinary conditions and service. Minimum of dead weight in the construction, not involving skilled labour.

Minimum of cost, using cheap and abundant materials.

Ability to resist effects of fire and water.

These conditions are as satisfactory in theory as they are difficult of attainment in practice, but considerable progress in the right direction is indicated by some of the more important public tests made during recent years in the United States, as given in Mr. Freitag's pages. Other tests are considered, dealing mainly with the strength of fireproof floors. Some inquiry into the fire-resisting qualities of wooden floors has also been made by the New York Building Department, from which the author deduces the superiority of "Salamander" lining over asbestos, in the case of tests 1 and 2 (Table II.), and points out that, as shown by tests 3 and 4, the lack of protection at the joints constitutes the main weakness for fire-resisting qualities in "mill-construction" floors.

Permanency and corrosion next receive attention, and as iron and steel are increasingly employed, even in this country, where skeleton construction has not hitherto been viewed with an approving eye, we can commend this chapter to the attention of our readers. Amongst other points, Mr. Freitag discusses the relation existing between corrosion and fireproofing; the causes of deterioration; the relative corrosibility of cast iron, wrought iron, and steel; the permeability, porosity, and chemical action of materials such as mortars, masonry, terra-cotta, and concrete; and the effects of leakage from pipes.

Terra-cotta floors receive ample attention in the work to which we refer, and the relative characteristics of porous and hard-burnt materials are pointed out, as well as the effective values of different forms of construction. A comparison is also made of various manufacturing processes and methods of setting terra-cotta work. Amongst other matters touched upon may be mentioned ceiling and floor details, protection from weather, and girder protection. As we have already said, the last-named is an absolute essential of fireproof construction. Many failures have resulted in times of fire from the great exposure and consequent collapse of insufficiently protected beams, and on this score Mr. Freitag remarks :—"There can be no doubt as to the vital necessity of protecting these members as carefully as ingenuity can devise. Girders, when they project below the ceiling line, as is commonly the case, are much more exposed to the injurious effects of fire and water than the ordinary floor beams. Intense heat is brought to bear on the corners or exterior angles of the girder protections, and the streams from the fire-hose tend to tear off the fireproofing of the girders, due to the resistance offered in the corners. The interior angles also create dead-air spaces at these points, which cause the flame to split up or separate, thus allowing the gathering of super-heated air in the interior angles. This often vitiates the cement, and if the blocks are not joined [mechanically, they will fall from position." We have quoted this passage because it appears to express some truths which are not always remembered by those responsible for the design and erection of buildings. In the remaining part of this chapter full descriptive details and illustrations are given of several types of girder-protection blocks. It should always be borne in mind that no load ought, under any circumstances, to be carried by the side blocks of girder protections.

Concrete and composition floors are next examined and illustrated by the author, and the respective qualities of many leading systems are pointed out. Speaking as to the relative merits of terra-cotta and concrete floors, Mr. Freitag quotes the opinions of some trustworthy experts, which, it will be observed, do not entirely tally. Thus we find in two reports made upon the Pittsburg fire (Table I.) there are distinctly conflicting recommendations respecting terra-cotta and concrete. The report of the surveyors states that "We believe that this same class of material (hard-burnt tile) of the end construction, made heavier throughout with an extra web to strengthen it and properly put up, would stand any ordinary kind of fire." On the other hand, the report of the board of engineers upon the same conflagration contains the following opinion :—"The most important lesson taught by this fire was the lack of strength developed by the fire-clay fireproofing. The floor arches showed by the scaling off of the lower webs that they were unable to offer any sufficient force to counteract the tendency to lateral motion. In view of these important developments, it is our opinion that important structures of this class should have a radically different method of fireproofing. There seems to be but one material that could be utilised to accomplish these results, and that is first-class concrete."

It does not appear that either form of construction fully conforms with the conditions formulated in the report of the engineers, and it is likely that floors formed of thick porous tiles with rounded interior corners to prevent cracking, with deep skew-backs, with arches having level ceilings and concrete filling of good quality, would accomplish the ends suggested by the criticisms in question. The New York Building Department tests are sufficiently favourable towards terra-cotta floors, and at the same time they ought to satisfy those who have adversely criticised floors of concrete and composition. Generally speaking, the conclusion may be drawn that either form of construction is satisfactory within certain limits, if carefully designed and executed, whilst, on the other hand, both may be unreliable if defective materials or workmanship be permitted. In Table IV. we reproduce comparative data stated by the author as to the weights of American floors.

The remarks previously made with regard to the protection of ironwork apply equally to the question of column fireproofing. Mr. Freitag treats this portion of his subject in a separate chapter, where some excellent sectional drawings are given, illustrative of almost every available type of casing. Fire-resisting partitions, it is to be feared, are not even yet recognised as essential details. So-called fireproof partitions are sometimes to be found, but little commendation can be awarded to such fittings. Referring to constructional details of this kind as exemplified in the United States, the author says :—"The average partition is nothing more than a light screen erected to subdivide areas according to the demands of tenants, to form

Table II.—Fire Tests of Wooden Floors. (New York Building Department, 1896.)

Areas of floors, 4 ft. square; fire applied by steam jet oil burners; temperature, 1,560 deg. Fahr.

Test.	Description of Floor.	Smoke Appeared.	Flame Appeared.
No. 1	Two thicknesses of ¾-in. tongued and grooved pine flooring, asbestos sheet between	18 minutes after start, at the joints	29 minutes after start
„ 2	Same section as No. 1, but with a layer of "salamander" in place of asbestos	27 minutes after start.....	40 „ „
„ 3	Mill-construction floor; the lower course 2-in. tongued and grooved spruce planks, covered with ¾-in. yellow pine. No fireproof filling	63½ „ „	67½ „ „
„ 4	Same as No. 3, but with a single layer of "salamander" between the courses	62 „ „	95 „ „

Another chapter treats of materials used in fireproof construction, and contains a good deal of information which may be well known, but is not always borne in mind. Here again we find the author reinforces his own statements by the quotation of practical data, some of which we have once more set forth for comparative purposes in the sub-joined table.

Table III.—Fire Tests of Building Stones and Terra-cotta.

Dimensions of Specimen.	Material.	Time of Heating.	Result.
3 inch cube.	Limestone.	10 minutes.	Allowed to cool gradually and was largely reduced to powder.
„ „	Marble.	„	Do. do.
„ „	Granite.	„	Began to fuse at rose heat and fell asunder when cool.
„ „	Brown Sandstone.	„	Showed greatest resistance but cracked and became useless on cooling.
„ „	Terra-cotta.	15 „	Immersed in water when white-hot and underwent little change.

Table IV.—Comparative Weights of various Floor Systems, in lbs. per square foot.

Type of Floor.	Floor Beams.	Girders.	Arch or Slab.	Concrete Levelling.	Concrete filling.	Screeds, 3 in. by 4 in., 16 in. centres.	Flooring ¾ Maple.	Ceiling Plaster.	Ceiling Construction and Plaster.	Wires and Centre Rods.	Total Dead Load.	Safe Live Load.
Terra-cotta end construction	6'0	3'5	39'0	7'0	21'0	1'5	4'0	5'0	—	—	87'0	150'0
Roebling, arch construction	6'0	3'5	41'0	—	21'0	1'5	4'0	—	10'0	—	87'0	150'0
Columbian, flat ceiling construction	6'0	4'0	34'5	—	21'0	1'5	4'0	5'0	—	—	96'0	150'0
Expanded Metal Co., No. 3 construction	4'0	3'5	30'0	—	21'0	1'5	4'0	5'0	2'0	—	71'0	150'0
Fawcett floor.....	6'5	3'5	14'0	36'0	21'0	1'5	4'0	5'0	—	—	85'5	150'0
Rapp, panelled construction.....	6'0	3'5	21'0	21'0	21'0	1'5	4'0	5'0	10'0	—	93'0	150'0
Metropolitan floor	6'0	3'5	25'0	—	21'0	1'5	4'0	5'0	2'0	0'5	68'5	150'0

corridors, or enclose stair or elevator wells, or make other architectural divisions. These partitions often include large areas of interior sash for the transmission of borrowed light to and from the corridors, or from one room to another, besides considerable quantities of wood in doors, door frames, and even in wainscotting. Thus the important question of fire-retarding capacity is largely lost sight of."

Plaster partitions of several descriptions are illustrated, and the drawbacks attendant upon certain of their details are fully investigated. It should be noted that the fire in the Methodist building at Pittsburg (Table I.) proved conclusively that plaster on metal lathing will not prevent the charring of woodwork behind the plaster, even when the latter material remains intact. Further, it is known that, apart from any question of the employment of wood, plaster construction is of little value in fireproof work. In justification of this doctrine, we may quote the results afforded by the Home Life Insurance building (Table I.), which are conclusive as to the utter failure of metal lath and cement mortar partitions either to confine or to resist fire. Mr. Freitag expresses the opinion that plaster cannot readily be bonded to any surface so as to successfully resist the combined action of fire and water, and although he admits lime-mortar to be a desirable fire-resister in itself, he does not think it capable of retaining its hold under the action of water.

Terra-cotta partitions have almost invariably suffered considerable injury in severe fires, but failure is usually the result of faulty design or construction, and not of inherent unsuitably, for the material possesses admirable qualities in respect of strength, and of fire and water resistance. The Home Life Insurance building fire (Table I.) indicated faulty design to a noticeable degree. Although little or no water was thrown into the upper floors of this building at the time of fire, many of the partitions collapsed under the influence of heat. This result is attributable to the fact that the fireproofing did not extend higher than 5 ft. above the floor line, and, beyond this height, interior sashes were placed for communicating borrowed light. Amongst other defects quoted by the author are the absence of proper fixing of partitions at the upper edges, and their formation upon wood, which in time of fire, will burn away or will shrink and thus cause instability.

American practice with regard to wall construction is not of immediate interest to British architects, but some useful matter is contained in that part of Mr. Freitag's work which deals with roofs, suspended ceilings, and furrings. Every one who considers the natural tendency of flame and heated air to ascend during the progress of a fire, must recognise the necessity for much greater care than is commonly exercised in the design of roofs and ceilings. In the earlier part of this article reference is made to the new Record and Admiralty buildings, where the only roof protection is to be found in fireproof ceilings. Either of these ceilings can be regarded as being entirely and absolutely incapable of injury by fire; they are not likely to develop greater powers of resistance than floors, which sometimes fail, although not so liable to conditions so severe as those to which roof ceilings may be exposed. Fireproof ceilings are, of course, in every way to be recommended, but prudence dictates their application in addition to, and not in substitution of, adequate roof protection. From the surveyor's report upon the Horne Store building fire (Table I.) we quote the following extract, which directly bears upon this insufficiently appreciated point:—

"All portions of the structure between the ceiling and the roof should be well covered, as the heat goes upward. In this case the intense heat of all the floors in the Store building rushed up the light shaft, elevator and staircase openings, and the top portion having no fireproofing, simply melted and let this immense tank, that was placed in the top of the building, plough its way through the several stories, each adding as they went their own weight and contents, and all went to the basement."

Although it may be questioned whether this quotation will be universally regarded as a theoretically perfect example of the English language, as understood in this country, its practical meaning is perfectly clear and well worthy of attention. The final chapter of Mr. Freitag's treatise on "Fireproofing" contains an account of the equipment recommended for fighting fires generally; and in the middle of the work the natural sequence of descriptive treatment is more or less interrupted by a dissertation upon fire-resisting design, and upon sundry materials and details, such as fireproof timber, wire-glass, interior openings, fireproof and protected doors, fireproof shutters, and various arrangements for the installation of mechanical appliances.

Taking the book as a whole, it may well be regarded as usefully summarising the chief features of fireproofing systems practised in the United States, and it is in every way worthy of perusal by architects and others who have at heart the further development of fireproof construction in this country.

NOTES.

Institute of Architects' Meetings.

THE small attendance at the reading of Mr. Killingworth Hedges' paper at the Institute of Architects' meeting on Monday evening affords another example of the regrettable fact that subjects of practical interest seem to receive so little support and attention from the bulk of the members. Nothing seems to draw a large meeting except papers on purely artistic subjects. Now architecture is not only the art but the science of building, and it is perhaps on the scientific class of subjects that information and discussion are of most practical value. At the Institution of Civil Engineers the announcement of a paper on any special question of structural or scientific improvement is sure to draw a large meeting and lead to an important discussion. But at the Institute it appears that the consideration of such an important and difficult subject as the protection of buildings from lightning, treated by an electrician, has little attraction for members. Surely it is the duty of those who carry out buildings, to take every opportunity of acquiring knowledge on practical subjects of this kind. That should be one of the main objects of an Institute of Architects.

Electricity and Engineering.

SIR WILLIAM PREECE gave the "James Forrest" lecture last Monday at the Institution of Civil Engineers. The subject chosen was "On the Relations between Electricity and Engineering," and, although it is very difficult nowadays to advance anything new about electricity, yet the lecturer's enthusiasm for his subject and the skill with which he illustrated the fundamental principles on which the science is based, made the lecture both instructive and interesting. If we might venture to criticise an authority whose experience as a practical electrician is unequalled, it would be to suggest that he took a too favourable view of the electrical progress made in this country. He surely ought to have given some proof of his statement that telephony was as far developed in England as in any other country in Europe. The ordinary electrician listens to such a statement with amazement. Again, Sir Frederick Bramwell, in seconding the vote of thanks to the lecturer, took the opportunity of mentioning how much the Act of 1882 had hindered the development of electric lighting. Sir William Preece, however, did not agree to this, but, on the contrary, thought that the Act was most beneficial. Such cheerful optimism is refreshing to listen to, but we are afraid that it is not justified by the facts of the case. The lecturer took a rapid survey of the modern developments of electricity. He showed a new telephone switchboard suitable for exchanges, where the attendant is summoned by a lamp lighting instead of by a bell. Such an arrangement must make life in a telephone exchange much pleasanter. He described some of the electrical arrangements devised by Mr. Webb at Crewe for raising signals, moving points, &c., and stated that there would soon be rapid developments of these applications. In his opinion the combination of electric lighting and traction stations was highly desirable. He instanced St. Helens, where the cost of generating an electrical unit had been reduced from 3·2d. to 0·67d. by combining the electric lighting works with the tramway station. In conclusion, Sir William Preece stated that not only does electricity economise labour and so increase national wealth, but recent developments in the application of it in medical practice promise also to alleviate human suffering.

Condition of Venice.

A HOUSE fell in Venice on the 21st inst., causing two deaths, and exciting that feeling of insecurity which has been manifested lately about the condition of buildings generally in this most singular of old cities. Such an event, if not common, has occurred often enough within the last quarter of a century to induce serious considerations about the more important monuments of Venice. Twenty years ago one of the church towers fell down, since then two old houses, and a new one in course of construction, have collapsed, causing numerous deaths. In the present case, that of a miserable old tenement house in the old Ghetto, the cause of failure is supposed to have been the clearing away of mud from the adjoining canal by means of a dredger. This laudable attempt to purify the canal, which, as usual in Venice, is little more than an open sewer filled with sea water, caused the slipping of the treacherous foundation and the lamentable accident. One of the neighbouring houses is expected to share its fate. Venice will be a serious problem for the next century. The insecurity of its old buildings, the horribly insanitary condition of the canals, the increase of its poor population, and the impossibility of closing the canals and yet maintaining circulation amongst the houses, are matters which will call for unprecedented ingenuity on the part of the civic authorities to resolve satisfactorily.

The Ducal Palace.

IN connexion with the subject of the previous note, it may be of interest to our readers to know that the question of the stability of the Ducal Palace is receiving great attention at present from the Venetian authorities. The alarming reports in some papers are apparently great exaggerations. An official report on the subject appears in the "IV.ª Relazione" of the "Ufficio Regionale," giving a reassuring account of the matter. An alarming impression has perhaps been created by the fact that the great library and the archæological museum are on the point of being transferred to other quarters. This new arrangement, it is hoped, will relieve the palace of a great deal of weight on the upper stories, and so avoid any danger in the future. This seems a very reasonable conclusion; the palace was never intended by its constructors to be a storehouse for the immense library and the weighty marbles, &c., forming the museum. Its own years are a sufficient weight for the venerable building to bear.

"Non-flammable" Wood.

THE value of non-inflammable wood (rendered fireproof by the electric fireproofing process) has been strikingly demonstrated by a conflagration which took place recently in the large Dun building, New York. The fire was confined to a single room, the whole of the woodwork in which had been treated by the process above mentioned. Seeing that the heat was so fierce that iron hinges were twisted and glass melted in the room, there appears to be no doubt that the building, or a great portion of it, was saved by the employment of this particular form of fireproof material. Experiments with wood thus treated, lately conducted in New York, show that even at a temperature of 1,900 deg. Fahr. the wood was little more than slightly charred. The latter test was made under the auspices of the Board of Fire Underwriters of New York City, and the Building and Fire Departments.

Arc Lamps and High Pressures.

IT seems probable that very shortly all the direct current electric companies in this country will supply at 200 volts or over. The Board of Trade have wisely fixed the limit at 250 volts, and already this pressure has been adopted on a large scale at Glasgow. It may be questioned, however, whether this high pressure will make the electric light more popular. The electric energy can certainly be supplied at a cheaper rate, but then most consumers want to buy light. From experiments we have made with certain glow-lamps we know that we can get more than 25 per cent. more light from 100-volt lamps than from 250-volt lamps for the same consumption of energy. Hence, unless the tariff is reduced more than 25 per cent., the consumers will be the losers. The disadvantages of 250-volt supply from the arc-lamp user's point of view are much more serious. If he uses open type arc-lamps, he must put five in series across the mains. Hence, if he only desires one lamp, the whole five must be turned on, and it will be impossible to practise those little economies by means of which electric lighting is made inexpensive. Another drawback is that one faulty lamp will make the other four unsteady. Supply engineers suggest that this difficulty can be avoided by using enclosed type arc-lamps, which are made to work across the 250 volts. From experiments made recently by Mr. W. B. Sayers, and communicated to the Glasgow Local Section of the Institution of Electrical Engineers, it appears that these arc-lamps give less than one-third the light that we could get from ordinary glow-lamps at the same cost, and hence, as arc-lamps for indoor lighting are in general only used for the sake of economy, the absurdity of the suggestion is apparent. If corporations take to supplying electricity at 250 volts, we agree with Mr. Sayers in thinking that they ought to supply a continuous current transformer to those consumers who desire to use arc-lamps, and that they should fix their meter on the low-pressure side of the transformer.

Clayton Old Hall, Manchester.

THE Corporation of Manchester have resolved to take steps for the repair and preservation of the Old Hall, which they bought four years ago, and have appointed Mr. A. Darbyshire to superintend the work. Clayton Old Hall was sold by the Byron family in 1620 to the brothers Humphrey and George Chetham. On the death of the latter in 1627, Humphrey—to whom Manchester owes much—succeeded as sole owner, and occupied the house until his death in 1653. The wide moat is crossed by a bridge having two arches and three-sided crenelles. which, it is supposed, was built in the later years of the fourteenth century, and some years before the oldest remaining portion, which is post-and-pane work, of the house itself. Some additions were made, and, as some aver, by Humphrey Chetham, in the former half of the seventeenth century; the Old Hall suffered further change about one hundred years ago. The scheme provides for setting aside a part of the fabric for the purpose of a museum of relics associated with Chetham, of whose college and library, formerly part of the Cathedral collegiate buildings, we gave two illustrations on November 7, 1896: "The Architecture of our Large Provincial Towns: No. II. Manchester"; one showing the little quadrangle or cloister court, as reinstated by Mr. Medland Taylor.

Messrs. Tooth & Sons' Gallery.

THE picture by M. François Flameng, called "La Revue, 1810," and representing Napoleon reviewing cavalry on the Place du Carrousel, which is on view at Messrs. Tooth & Sons' Gallery, is a work that seems to imply that M. Flameng aims at being the successor of Meissonier as a painter of military subjects; and he is not far behind his model. It is, to be sure, a picture to be rather regarded in detail than as a whole; it is a piece of realism rather than an artistic conception; but in that light it is a signal success. A line of cavalry in full trot occupies the foreground, the nearest rider violently pulling at his horse to keep the line; in the background are seen a group consisting of Napoleon accompanied by Grouchy, Duroc, Soult, Marmont and Ney. It is this group which is the most remarkable portion of the picture, and the portion most especially recalling and rivailing Meissonier. The Arc du Carrousel rises at the back of the scene. The picture is well worth a visit.

Ruskin's Turner Drawings.

THE Fine Art Society announce that the Turner drawings which were Ruskin's property, and were exhibited at their gallery in 1878, are to be exhibited there again, by the consent of Mr. and Mrs. Arthur Severn. The exhibition will also include a recent portrait of Ruskin by Mr. Severn. We would suggest that the interest of the exhibition would be increased if a collection of Ruskin's own drawings were added to it. They are always worth seeing; and if Ruskin had done more drawing and less writing he would have done himself more justice.

THE NEW GALLERY EXHIBITION.

THE death of Burne-Jones has been a seriou loss to the New Gallery exhibitions; how serious is evident from the fact that such a piece of commonplace as the picture entitled "The Rock of the Sirens" should have had a central place in the west room. The only works of the first order to be found there are among the portraits, of which there are in the same room two exceptionally fine examples — Mr. Jacomb-Hood's vigorous and lifelike portrait of the Queen's Coroner, Mr. Mellor (156); and Mr. Melton Fisher's noble one of the Countess of Denbigh (166), in which no doubt the artist has been exceptionally fortunate in his subject, but he has produced a work of art worthy of her. Mr. Shannon's portrait of Mrs. Shannon (185) is rather too *posée* in attitude, and has the defect that one feels one's attention distracted from the personality of the sitter by the elaboration of the dress and accessories. The same is the case with the artist's "Mrs. Temperley" (244) on the opposite wall, a more powerful picture, in which the dress, regarded as drapery, is most effectively and picturesquely treated, but the face seems the only uninteresting portion of the picture, and is dead and cold in colour. After all, the real object of a portrait is the human subject, not the glitter of silks and textile decorations. Mr. G. F. Watts, in his quarter-length of Mr. Wilfrid Blunt (139), illustrates another scheme of portraiture, in which the person is predominant over the costume no doubt, but face and costume together are treated as a study in

colour. Considered in this light the portrait of Mr. Blunt and that of "Miss Lina Duff Gordon" (145) are fine and interesting pictures, only we feel no conviction that they are good likenesses, as we do in the case of Mr. Jacomb-Hood's portrait in the same room, already referred to, and which is so strong in individual character. Among the portraits of the year one of the finest is Mr. Sargent's "The Hon. Victoria Stanley" (248), a little mischief of a girl in a short red cloak and holding a hunting-crop ; this is a portrait, and a very characteristic one, not a mere pictorial study. Mr. Robert Brough's two portraits, "Mrs. William Pyper of Hillhead" (149) and "The Viscountess Encombe" (190) are noteworthy for a remarkably broad and free style of execution, the result of which is perfectly satisfactory in effect ; this is really artistic work, and the demands of portraiture and of pictorial effect are justly balanced. At the top of the north room, also, are two admirable portraits by Sir George Reid, those of Dr. Fairbairn and Macleod of Macleod (215, 219).

The first room (south) includes what one may call the curiosities of the exhibition, such as Mr. Spencer Stanhope's large picture of "The Expulsion from Paradise" (58) where a mediæval angel in highly ornate armour drives out a Burne-Jones Eve, and Mrs. Evelyn de Morgan's "Ithuriel" (41), a decorative treatment of the Miltonic angel preparing to touch with his spear Satan—

"Squat like a toad, close at the ear of Eve."

This also is a more or less Gothic picture, Ithuriel, in an attitude of conventional stiffness, occupying the centre of the canvas, with a background of small cherubs' heads, the nude Eve sleeping at his feet (her consort seems to be forgotten) ; but though stiff and unattractive as a whole, it contains beautiful work in detail. What Mr. Brangwyn is aiming at in his "Charity" (24) we do not understand ; it is a symbolical treatment of the subject apparently, but the recipients of charity seem to be remarkably richly dressed, and the colour has all gone out of the flesh into the vestments ; yet the total effect can hardly be called decorative, either in line or colour ; it is the work of an original artist, but as such it is disappointing. Mr. Boughton's two small works, "A Song of Spring" and "Ashes of Roses" (5, 11), each of them showing an ideal figure amid foliage, are very pretty bits of sentiment, with more in them than appears at first glance. Mr. Walter Crane paints a decorative picture with a moral, under the title "A Stranger" (71), the stranger being the figure of Peace with the symbolical olive branch, hovering with a sad expression above the dark shoulder of the earth—a pleasing work, but perhaps more attractive for its sentiment than for its artistic effect. With this may be contrasted Sir. W. Richmond's charming little picture "By Summer Seas" (88), painted in a flat decorative style, and representing a nude figure reclined at full length by the sea which forms the background ; a contrast to Mr. Crane's inasmuch as it represents painting purely for beauty of line and with no special idea attached to it. A more prominent work is Mr. Collier's society scene "A Proposal" (267), a young man in evening dress with his face turned away from the spectator, proposing to a lady seated in an arm-chair in a richly-furnished room ; everything is capitally painted, but for any expression of feeling in the lady's face she might be listening to the merest ball-room small-talk. Perhaps this is a moral too, and indicates the manner in which a well brought-up young woman ought to conceal her feelings on such an occasion ; but it is a treatment that hardly adds to the interest of the picture.

Mr. Austen Brown's "Wayside Pasture" (218) forms a connecting link between figure pictures and landscape, since it includes both elements ; it is one of the most striking and original works in the Gallery, though rather perhaps in the way of promise than performance, for both figures and landscape are treated in a rather crude manner, the whole thing looking too much as if cut out in silhouettes of different colours ; but it is a picture not to be passed over. The only landscape on a large scale, Mr. Thorne Waite's "The Home of Caedwalla" (106), is a sentimental rather than a great picture. There are some good landscapes on a smaller scale ; one by Mr. G. F. Watts, "Loch Ness" (133), the best landscape we have seen from him, with a very beautiful aërial effect of light and colour in the sky and its reflection in the lake a fine picture of "Evening" (101), by Mr. Perppercorn, who perhaps tends to become a little too vague in his poetic treatment of landscape, but who at least never misses the poetry of a scene ; an interesting study of early morning effect on the Lago Maggiore (118) by Mr. Alfred East, and "The Boat Race" (184), by Mr. John R. Reid, which is really to be judged as a landscape, in spite of its title, and in which the middle distance is one of the best bits of landscape in the galleries. In addition to these, we may mention, among the smaller works, Mr. Orrock's "Morwick Mill" (34), rather mannered in the foliage, but with a fine sky ; Mr. Priestman's "Watering Cattle" (80) ; Mr. Arnesby Brown's "The End of the Harvest" (100) ; Mr. MacWhirter's "The Gates of the Forest, Sherwood" (165) ; and Mr. Frank Walton's "Townhurst Woods" (235), a miniature forest landscape of much beauty and delicacy. Mr. J. L. Pickering's "The Silence of the Hills" (207) shows a very fine sky, but somehow the picture as a whole strikes one as rather a made-up effect.

The most important work in sculpture, though one of the smallest, is Mr. Pomeroy's sketch model for a statue of Cromwell on a pedestal ; the statue has dignity and character, the pedestal might be improved in architectural detail. Mr. Alexander Fisher's work, described as an "Overmantel in Enamel and Ivory" (462), is really an overmantel in brass with reliefs in enamel and ivory in the three bays. The reliefs represent "The Garden of the Hesperides," "Inspiration," and "The Knowing Angel" ; the subjects are effective in themselves, but hardly harmonise with what may be called the architectural setting, which is, however, very well treated as a piece of metal design. A lectern eagle in brass (493) designed by Mr. J. H. M. Furse is a refreshing contrast to the usual trade eagle. Among other things to be mentioned are Mr. Emil Fuchs's marble bust entitled "The Coquette" (483), on a decoratively treated bronze pedestal ; Mr. Mullins's bust of the late Dr. Martineau (491), and some small cases of jewellery by the Ranee of Sarawak, Miss Elinor Hallé, and Mr. and Mrs. Dawson.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

AN ordinary meeting of this Institute was held at 9, Conduit-street, W., on Monday evening, Mr. William Emerson (President), occupying the chair.

Mr. Alex. Graham (Hon. Secretary), announced the decease of Mr. Benjamin Edmund Ferrey, F.S.A., who was elected Associate in 1868 and Fellow in 1877.

Mr. Graham also announced that Mrs. Reynolds Rowe had presented to the Institute a portrait of her husband, the late Mr. Reynolds Rowe, of Cambridge. The picture was exhibited from the Chairman's table, and a vote of thanks to Mrs. Rowe was agreed to, on the motion of Mr. Graham.

Mr. W. J. Locke, the secretary, announced that at a statutory examination last week three candidates were examined and passed—namely, Henry Nathaniel Kerr, Walter Henry Woodward, and Ernest Alexander Young. The Council of the Institute had granted these gentlemen certificates of competency to act as district surveyors in London.

Protection of Public Buildings from Lightning.

Mr. Killingworth Hedges then read a paper on the "Protection of Public Buildings from Lightning," of which the following is an abstract :—

Mr. Hedges began by a reference to points brought forward in his paper on "The Fire Risks of Electric Lighting," read before the Institute in 1884, and in Colonel Parnell's paper on "The Action of Lightning Strokes in Regard to the Metals and Chimneys of Buildings," read before the Institute in the same year. In the same connexion were quoted opinions of Dr. Oliver Lodge, F.R.S., and Professor Kirchoff, of Berlin. Since the Report of the Lightning-Rod Conference in 1882 there had been no official report on the effect of lightning strokes on buildings protected by conductors, and he hoped his paper would elicit some expression of opinion from architects, who had more opportunities of observing such effects than engineers. Discussing the action of a lightning flash, the author called special attention to its surging effect, which has very destructive tendencies. Lightning conductors, as usually arranged, do not guard at all against what Dr. Lodge termed the "spitting" action. They may serve to discharge or pass off on to the atmosphere the induced electricity from the earth and from the buildings upon it ; but as lightning protectors they are so arranged that should they be actually struck by a flash the building would probably be set on fire ; there was a chance, too, that a portion of the electric current would be diverted into unearthed metal-work, and prove most destructive in its tortuous course to earth. For the sake of these public buildings, it was necessary to explode the fallacy that a properly constructed lightning-rod never failed. During thunderstorms the atmosphere and all conducting objects in the immediate neighbourhood become charged with electricity at a constantly increasing potential or intensity as we recede from the earth. Even objects directly on the earth, such as railroad tracks, high fences, &c., become charged and will spark. The characteristics of a lightning-flash more particularly concerning the present subject are :—(1) Surging, due to the oscillatory character of the spark, and consisting of a disruptive discharge, sudden and violent, more like the blow of a hammer ; (2) Self-induction, a property which gives rise to counter force or choking effect, noticeable in straight wires, but much more pronounced in coils of wire ; (3) Side-flash, the result of self-induction. A disruptive discharge will often leave what would ordinarily be called an excellent conductor, and side-flash through the air to other much worse conductors ; for instance, the lightning-rod may be struck, but instead of following the course provided, a side-flash may select its own path through a wall of brick or stone to a neighbouring gas-pipe or bell-wire. The phenomena of surging and self-induction were described by the author and illustrated by diagrams.

In dealing with the question whether our public buildings are efficiently protected, the author first reviewed the methods formerly adopted for the protection of St. Paul's Cathedral. The spire of old St. Paul's was partially damaged by lightning three times, and its destruction by fire in 1561 was attributed to the same cause. The author had recently to report on the lightning conductors put up at the Cathedral in 1872. These took the place of the original system erected under the advice of the Royal Society about 144 years ago. They were considered at the time to be the most advanced system of protection. The system was thoroughly overhauled by the author for the purposes of his report, and pronounced to be open to serious criticism. Elements of danger due to inadequate conductors, faulty connexions, non-protection, and other causes were found to exist. Of the dome, statues, choir, and towers, none were efficiently protected. The author read extracts from his report, and fully detailed the weak points in the installation. This was an average specimen of the method of protecting public buildings. That more disasters do not happen is due to good luck, and to the fact that the warm air ascending from the numerous chimneys in large towns helps to lessen the violence of thunderstorms ; but should a direct flash strike an insufficiently-protected edifice, a disaster would occur. Descriptions of continental and American practice were given by the author, and details of installations on public buildings abroad which he had inspected. The method adopted at the Cathedral of Nôtre Dame, Paris, the author considered somewhat lacking ; that at Cologne Cathedral was far more advanced, the work being carefully executed, and of a design which might be followed with safety. At the Palais de Justice, Brussels, was installed the most recent adaptation of the Melsen system, details of which were given. The author next gave an account of his rearrangement of conductors for the better protection of St. Paul's. The plan recommended by him, taking into consideration the large amount of copper cable already disposed about the building, was, first, to run three new cables from the metal-work of the framework supporting the cross to the roof of the dome (making inter-connexion with the iron supports of the structure) ; there connecting them with the eight existing conductors, and reuniting them at the base of the dome to the existing system, which is increased by running a new ½-in. seven-ply copper cable on the top of the parapet entirely round the building. From this horizontal conductor, aigrettes, consisting of five pointed copper

rods, were teed at intervals by means of special brass boxes tinned inside, into which the cable was placed, the aigrettes first secured by binding and the whole united by running in hard solder. The method of obtaining efficient new earths (a matter of difficulty owing to the nature of the ground), of the process of earth attachment, and the general arrangements were fully detailed and illustrated.

This installation should not be taken as a model one, except, perhaps, with reference to similar ecclesiastical structures, which do not lend themselves very readily to the improved methods of protection, such as the author recommended for all new public buildings. It is almost impossible to draw up a set of rules to be universally applicable; each building should be carefully studied, first, as regards its position with neighbouring structures; secondly, as to the disposition of the metal employed; and, thirdly, with reference to the subsoil and its suitability for earthing the conductors.

Under the head of practical questions, the author then recapitulated a number of rules and principles laid down by Professor Lodge, supplemented with suggestions of his own, his aim being to elucidate the possibilities of improvements in the erection and testing of lightning conductors. In conclusion, he warned those who had to specify methods of protection to put no faith in the generally received opinion that a certain space contiguous to a lightning-rod is completely protected by it, so that if the rod is raised high enough a building in this protected region is safe. Nothing was more illusory; no space near a rod could be definitely styled an area of protection, for it was possible to receive violent sparks or shocks from the conductor itself without taking into account the phenomena of surging and self-induction.

The paper was further illustrated by slides giving views of St. Paul's, Westminster Abbey, Nôtre Dame and Cologne Cathedrals, and Rockliffe Church, also of lightning discharges showing, first, the popular representation of a flash of lightning, followed by others taken from photographs of actual discharges. These were lent by the Royal Meteorological Society.

On the table were specimens of the fittings designed by the author for St. Paul's Cathedral.

Mr. E. T. Hall inquired whether Mr. Hedges advocated that the lightning-conductor should be insulated away from a building or attached by metallic branches or brackets. He instanced a case of a high chimney-shaft. Was it better that such a structure should have its conductor insulated or attached by bands fastened to the brickwork?

Mr. Hedges replied that perfect insulation was of great importance. The ordinary porcelain insulator was very little good as a matter of fact, for when rain moistened the surface, it became partially a conductor. His view was that it was better to keep the cable away from the brickwork, and it was desirable, in his opinion, not to take it in and out of the projections of the buildings. It was best done by having supports and a stranded conductor stretched vertically alongside of the shaft. Supports of metal could be built into the shaft; there was no real danger of the electric current running, by this means, into the shaft itself.

Mr. W. Marriott, Assistant Secretary of the Royal Meteorological Society, remarked that his Society was very much indebted to the Institute for having taken part in the Lightning Rod Conference in 1878 and the following two or three years. The Institute was represented by Professor Lewis and Mr. Whichcord, and they, with their colleagues, drew up a report which, he believed, constituted the standard work on the subject to this day. For himself, he believed that if the instructions there given were followed, the greatest amount of protection would be afforded to buildings. Of course, it depended on the architects how much the lightning conductor outside a building would destroy its artistic effect. The definition of lightning given by the author from a work published in 1820, seemed very vague. Perhaps the best definition was this:—"Lightning is the visible discharge of electricity between one group of clouds and another, or between the clouds and the ground from a thunderstorm." The office of the lightning-conductor was, put simply, to carry the electric discharge from the clouds to the earth. He had been very much interested in investigating the phenomenon of thunderstorms, and had seen many spectacles which could not but charm and fascinate them. He described the peculiar features attending the photographing of the flashes of lightning that had been thrown on the screen that evening, and pointed out that thunderstorms were but small atmospheric disturbances, or miniature cyclones, of which so much was written.

Mr. J. Slater said he should not like them to separate without according a vote of thanks to Mr. Hedges for the extremely interesting way in which he had presented the subject before them. He also desired to include in that vote Mr. Marriott. There were one or two points in Mr. Hedges' paper which came as surprises to him. As to the best materials for lightning conductors, he did not know whether it was a modern idea or not, but he certainly understood that the majority of electrical engineers who were consulted in connexion with tall chimney shafts preferred tapes to stranded wires. He had always understood that one great advantage of tapes over wires was that all connexions that had to be made could be done so much more easily. He quite understood that they got a more elaborate system of connexions by wires, but was it not a fact that these were very much more expensive than the connexions with tapes? Another point had occurred to him with regard to the safety of tall chimneys. Was there any possible risk to a brickwork chimney if they had iron-hoop bond in it not in connexion with the lightning conductor? Of course, when one had a tall shaft he felt inclined to put in hoop iron bond, but should there be a possibility of the lightning current jumping across from the conductor to that metal, they would be inclined to modify their inclination and avoid the use of this altogether.

Mr. E. T. Hall, who seconded the vote, said the lecture had been exceedingly interesting. Many of them remembered the report to which Mr. Marriott had referred. It was drawn up many years ago, and he was glad to hear on such good authority that it formed a text-book upon which they could still rely. He hoped Mr. Hedges, in his reply, would give his opinion on the following point. It had become a practice now, in order to get rid of large quantities of steam from big engine installations, that the exhaust pipes should be carried up the centre of the chimney shafts. Was that at all dangerous from a lightning point of view? They were secured by cast-iron stays all the way up. What he should like Mr. Hedges' opinion on was—Which would be the best way to protect the shaft? It was assumed that outside there was the ordinary lightning-conductor. Might not the lightning perversely strike the iron shaft, and, if so, how could such a structure be protected?

Mr. H. Hardwicke Langston remarked that in the photographs of lightning which had been reproduced on the screen, they had seen that all the streaks were crooked, none were straight. How was that associated with the theory that the means for conducting the flash should be straight? Again, was not the flash, of which they saw the result, electricity being liberated rather than the progress of electricity itself?

Mr. Brodie desired to put a question also on a practical point. Was it necessary to protect lightning conductors so that people should not be in danger when they leaned against them? Would not the current go through a man resting against the conductor instead of through the conductor itself? If that were so it would be necessary to very carefully guard the conductors.

Mr. Hedges, in reply, said that in regard to most great buildings there was a difficulty in getting information as to the means that were adopted in protecting them from lightning. This circumstance led him to express a hope that something would be done, so that gentlemen in the architectural profession would feel sufficient interest in the subject to encourage a central body to collect all the data so that the experience of the profession might be available. He was afraid the Lightning Rod Conference report referred to by Mr. Marriott was rather old for the purposes of to-day. He would rather suggest that something should be done to resuscitate the committee referred to by Mr. Marriott; gentlemen should be elected by the Council of the Institute of Architects, by the Meteorological and other learned societies interested. Then the question of cost would arise. On this he would suggest that the British Association should be asked to make a grant. The question was, he thought, discussed at the Bath meeting, but there did not appear to be anybody to take the matter up. If, however, it was brought forward by some institute of standing such as that of the architects, popular interest might be revived, and so much information collected that they might obtain excellent data. For his own part he had to rely a great deal upon the information supplied by clergymen to whose churches disasters had occurred. One of these happened last week at Thirsk. A thunderstorm occurred—the same, in fact, that passed south, and at St. Mary Cray resulted in the death of a man who sought shelter in an iron-roofed shed. At Thirsk, it appears, the church, which was not protected by a conductor, was not damaged at all, but the neighbouring chapel was very seriously knocked about. The accident corroborated what he had told them about the side flash. There was a sort of vane over the chapel. The lightning struck it, the current first ran down the slate roof to the gutters, and then endeavoured to jump to earth, but found a better outlet by the rain water-pipe. There was a certain amount of surging in an upward direction and the usual displacement of the ground due to the inefficient earth connexion. Proceeding to reply to the questions addressed to him, Mr. Hedges said that, with regard to the use of tape, he preferred stranded cable, but at the same time tape had the advantage of being somewhat cheaper. As regards the employment of hoop-iron in shafts, Professor Lodge's experiments showed there was a tending to side flash to metals. Tall chimneys were, as a matter of fact, seldom struck when in use. The heated air made an excellent conductor; indeed, in laboratory experiments the electric discharge would leave the conductor preferring the heated air from the artificial chimney. With regard to Mr. Hall's question on exhaust pipes in chimneys, he thought that care should be taken to earth the pipes; and in reply to Mr. Brodie he would like to say that he would not care to lean against a lightning conductor when a discharge was passing through it. The probability, however, was that the current would pass down the conductor to the earth provided the earth connexion was suitable, except in the event of the man's clothes being wet from the rain; in this case some of the current would probably be diverted through his body.

Mr. Marriott, in returning thanks, remarked that lightning conductors should be of sufficient capacity to carry the current, or it would leap from one point to another, and thus cause great damage. He had been asked to explain how it was that in a church, the spire of which was struck by lightning, the windows were blown out. As in the case of tornadoes, it was probably due to the expansion of the air inside the building.

The Chairman, in conveying the vote of thanks to Mr. Hedges and Mr. Marriott, said that with regard to Mr. Hedges' suggestion that architects should co-operate in obtaining definite data on lightning conductors, he confessed that he thought the proposal was a very useful one. At the same time, he thought those interested in the compilation of such particulars should supply forms that could be filled up by persons not scientifically informed on the matter. If Mr. Hedges would formulate a scheme he would promise that it should have the best consideration of the Council. He concluded by announcing that the next meeting would be held on May 7 for the presentation of the annual report and transaction of other business.

COMPETITIONS.

WATERLOO BOARD SCHOOL, OLDHAM.—There were thirty-five competitors in this competition, and Mr. A. N. Bromley, of Nottingham, was the assessor. The plans under motto "Wellington" were placed first by him, and the Board adopted his award, and appointed as architect, their author, Mr. R. Holt, architect, Liverpool.

BUILDING IN FENCHURCH-STREET.—Some extensive building operations have been begun on the northern side of the street. Mr. H. H. Collins has prepared the plans for a block of offices and shops to be erected by Mr. H. Lovatt, of Wolverhampton and West Kensington, contractor, upon the ground between No. 119, the "Olde Elephante" tavern, and Cullum-court; and Mr. G. D. Martin is the architect of the new premises on the site of No. 124. The adjacent houses between Fen-court and Tabernacle-alley, westwards, are also about to be re-built.

House, Mount Pleasant, Tunbridge Wells. Mr. C. H. Strange, A.R.I.B.A., Architect.

HOUSE, MOUNT PLEASANT, TUNBRIDGE WELLS.

THIS residence was designed for a medical man, and advantage was taken of the fact that the site is bounded in front and back by roads at different levels to obtain the consulting-rooms, &c., in a lower ground floor approached from the main street, while the principal entrance to the house is from the higher road (the opposite side to that shown in the sketch). The lower story is of stone, the upper ones are of red brick, and the roof is tiled.

Mr. C. H. Strange is the architect, and the contractors are Messrs. Strange & Sons, of Tunbridge Wells.

ARCHITECTURAL SOCIETIES.

EDINBURGH ARCHITECTURAL ASSOCIATION.—The Edinburgh Architectural Association visited Ravenscraig, St. Serf's Tower, and Dysart House on the 21st inst., by permission of Mr. Michael B. Nairne. The party drove first to Ravenscraig, when Mr. J. A. R. Inglis, A.R.I.B.A., in describing the Castle, said that, built in 1460, it had in plan much to interest, and that, unlike many similar Scottish buildings of the period, the name of its builder, the date of erection, and even the cost of much of the material were still on record. The members then walked through the policies to St. Serf's Tower, when Mr. Inglis pointed out that the north aisle had been wholly sacrificed to form the new road. After examining the caves of St. Serf, the party assembled in Dysart House. On the motion of Professor Baldwin Brown a vote of thanks was accorded to Mr. and Mrs. Nairne for their courtesy, and to Mr. Inglis for his descriptions.

DUNDEE INSTITUTE OF ARCHITECTURE.—The results of the competitions arranged by the Dundee Institute of Architecture, Science, and Art have just been announced. There were three entries for sketch work, and the prize was awarded to Mr. F. Webster (Messrs. Keith & Sons' office). The exhibit of Mr. A. W. Lawrie (Mr. T. M. Cappon's office), in the section for the design of a golf club-house was placed first, and honourable mention was made of the work of Mr. A. S. Macrae (Mr. J. P. Bruce's office) and of Mr. John Soutar (Mr. Cappon's office). Mr. William Stocks (Mr. T. H. Thoms' office) has won the first prize for a design for a fireplace. There were six other sections, but only one competitor appeared in each, and the Council awarded suitable honorariums. The judges—Messrs. T. Ross, A. H. Crawford, and G. S. Aitken, Edinburgh—in their report stated that many of the drawings showed considerable evidence of skill both in design and drawing, and were much in advance of what could be produced by pupils a generation ago.

SCHOOL-CHURCH, OSSETT, YORKS.—The foundation stone was laid on the 16th inst. of a new school-church, which is to be erected in Junction-road, Ossett. The building, which will be entirely of stone on the outside, with ashlar dressings from the Holmfirth quarries, will measure 50 ft. by 22 ft. A movable screen will separate the chancel end from the rest of the building. The architect is Mr. A. S. Marriott (Messrs. Marriott & Son).

METROPOLITAN ASYLUMS BOARD.

THE ordinary meeting of this Board was held at the County Hall, Spring-gardens, on Saturday last, Sir E. Galsworthy presiding.

Local Government Board Sanctions.—Communications were read from the Local Government Board authorising the expenditure of a further sum of 559*l.* on the erection of additional ward pavilions at the North-Western Hospital, and of 257,000*l.* on the erection of Joyce-green Hospital, and approving plan relating to the proposed additional accommodation for laundrymaids at Leavesden Asylum.

Grove Hospital.—The Works Committee reported that on December 16 they were empowered to appoint a firm of landscape gardeners to advise as to the laying-out of the grounds of this hospital for an agreed fee. They now submitted a plan, together with a descriptive report, prepared by Messrs. Milner & Son, for this work, the total cost of which they estimated at 2,637*l.*, which sum included certain works to roads and drainage, forming a proper path, paved and kerbed, between the nurses' and servants' dormitories and day-rooms, and various granite pavings to coal stores and road crossings, &c. On the recommendation of the Committee, the report and plan were approved, and the Committee were empowered to invite tenders by advertisement for the execution of the necessary work.

Work at Leavesden Asylum.—The Works Committee reported that they had informed the Local Government Board, in reply to their letter, that the total cost of the proposed alterations and additions to the laundry at Leavesden

Cricket Pavilion, Nevill Ground, Tunbridge Wells. Mr. C. H. Strange, A.R.I.B.A., Architect.

Asylum would amount to 5,650*l.*, namely, 2,700*l.* for structural alterations, 2,000*l.* for machinery, 450*l.* for architect's commission, quantity surveyor's charges, and clerk of the works' salary, and 500*l.* for contingencies.

Concrete Drains.—Reporting upon Tooting Bec Asylum, the Works Committee stated that, pursuant to instructions, they had further considered the decision of the Wandsworth District Board of Works that the rain-water drains to the Tooting Bec Asylum should be laid in concrete, and they now recommended :—

"That the Clerk be instructed to address a communication to the Wandsworth District Board of Works, calling their attention to the decision of the London County Council not to interfere with the requisition of the Board of Works that the rain-water drains at the Tooting Bec Asylum should be laid in concrete, and expressing a hope that, having regard to the serious expense which this decision will involve and to the importance of the precedent which it will create, the Board of Works will, notwithstanding the failure of the managers' appeal, allow the matter to be re-opened and further discussed before the Board of Works enforce their order."

This was adopted.

EXTENSIONS, ST. OSWALD'S CHURCH, SMALL HEATH, BIRMINGHAM. — The additions to St. Oswald's Church, Small Heath, Birmingham, consisting of west front, two adjoining bays, and south-east porch, which complete the body of the edifice, were dedicated on the 23rd inst. Mr. W. H Bidlake was the architect, and Mr. T. Rowbotham the builder. The sculptural work was executed by Messrs. Martyn & Co., of Cheltenham.

CRICKET PAVILION, NEVILL GROUND, TUNBRIDGE WELLS.

THIS pavilion was carried out last year. It contains, in addition to a large club-room overlooking the cricket field, three dressing-rooms fitted with shower-baths, lavatories, &c., secretary's room, scorer's room, kitchen, refreshment room, &c. The lower floor has walls of red brick, the upper story is of timber construction, and the roof is tiled. Its cost was about 1,000*l.* The architect is Mr. C. H. Strange.

APPLICATIONS UNDER THE 1894 BUILDING ACT.

AT the meeting of the Building Act Committee of the London County Council, held on the day before the Council adjourned for the Easter recess, the proceedings were governed by the clause in the order of reference which empowers the Committee at certain seasons to act on behalf of the Council in relation to matters included in the order of reference. Those applications to which consent has been given are granted on certain conditions. Names of applicants are given in brackets. Buildings are new erections unless otherwise stated.

Lines of Frontage.

Hampstead.—A conservatory at a house known as Wychcombe, Haverstock-hill, Hampstead (Mr. L. Sharp for Mr. G. Monro).—Consent.

Hampstead.—That the application of Messrs. Physick & Lowe for the London and South-Western Bank, Limited, for an extension of the periods within which the erection of a one-story addition in front of No. 318, High-road, Kilburn, to flank upon Netherwood-street, was required to be commenced and completed, be granted.—Agreed.

Islington, North.—A one-story shop on part of the forecourt of No. 125, Stroud Green-road, Islington (Mr. F. E. Grayson for Mr. D. F. Keer).—Consent.

St. George, Hanover-square.—Formation of inclosures to an open portico in front of No. 52, Eaton-place, St. George, Hanover-square (Mr. A. Tillotson for Mr. T. Ralli).—Consent.

Wandsworth (detached).—Dwelling-houses on the west side of Croxted-road, Dulwich, between Dalkeith-road and Turney-road (Mr. C. M. Quilter for Mr. S. Admans).—Consent.

Hammersmith.—Retention of one-story shops on part of the forecourts of Nos. 308 to 316 (even numbers only), King-street West, Hammersmith (Mr. A. Lines for Mr. J. R. Chibnall).—Refused.

St. George, Hanover-square.—An iron and glass shelter, projecting over the public way, at the entrance to the Grosvenor Hotel, Buckingham Palace-road, Pimlico (Messrs. A. Waterhouse & Son for the London, Brighton, and South Coast Raway Company).—Refused.

Strand.—An iron and glass shelter at the entrance at the junction of Cranbourn-street and Charing-Cross-road, to the London Hippodrome (Mr. F. Matcham for the London Hippodrome Company, Limited).—Refused.

Woolwich.—The rebuilding of the "Red Lion" public-house on the north side of Shooter's-hill, Plumstead (Mr. J. O. Cook for Mr. C. Beasley).—Refused.

Projections.

Westminster.—A porch to a block of residential flats in course of erection on the west side of Emery-hill-street, Westminster, at the corner of Francis-street (Mr. E. J. Stubbs for Messrs. J. Allen & Sons).—Consent.

Whitechapel.—Retention of an iron guard-rail, fixed over the cornice at the fourth floor level, in front of Nos. 31 to 35, Whitechapel High-street, at the corner of Commercial-road (Mr. J. W. Chapman for Messrs. Gardiner & Co).—Consent.

Width of Way.

Deptford.—Five houses on the western side of Friendly-street, Deptford (Mr. G. Wilson).—Consent.

Hammersmith.—Buildings in Davisville-road and Percy-road, Shepherd's Bush (Mr. A. Chapman for Mr. G. Godfrey).—Consent.

Westminster.—A sand store on the west side of Brewer's Green, Caxton-street, Westminster (Mr. G. R. W. Wheeler for the Vestry of St. Margaret and St. John, Westminster).—Consent.

Whitechapel.—A one-story addition to the infants' school, All Saints' schools, Buxton-street, Whitechapel (Mr. A. Cox for the managers of All Saints' schools).—Consent.

Westminster.—A building on the north-east side of Douglas-street, Westminster, between Nos. 10 and 18 (Mr. W. Workman for the Army and Navy Auxiliary Co-operative Supply, Limited).—Refused.

Space at Rear.

Woolwich.—A modification of the provisions of Section 41 (1) (vi.) of the Act with regard to open spaces about buildings, so far as relates to the proposed erection of a two-story dwelling-house, with a one-story shop, on the east side of Roydene-road, Plumstead, with an irregular space at the rear (Mr. R. A. Jack for Mr. J. B. Atkins).—Consent.

Deviation from Certified Plan.

Strand.—Certain deviations from the plan certified by the District Surveyor, under Section 43 of the Act, so far as relates to the proposed erection of a block of dwellings (adapted to be inhabited by persons of the working class), with shops on the ground floor, on the site of Nos. 51, 52, and 53, Brewer-street, and No. 28, Great Windmill-street, Golden-square, St. James's (Mr. W. Graves for Messrs. Spencer, Santo & Co., Limited).—Refused.

Lines of Frontage and Width of Way.

Bethnal Green, North-east.—The re-erection of buildings on the site of the Arabian Arms public-house, Nos. 222 to 232 (even numbers only), Cambridge-road, and Nos. 2, 4, 6, and 8, Bishops-road, Bethnal Green (Messrs. H. Dawson & Son for the trustees of the Moravian Trust Estate).—Consent.

Lewisham.—A school building and a dwelling-house on the east side of Torridon-road, Hither-green, with projecting buttresses, bay window, porch, &c., and with the forecourt fence at less than the prescribed distance from the centre of the road (Mr. E. J. Hamilton for the Rev. A. Hancock).—Consent.

Bethnal Green, South-west.—Three warehouses on the site of Nos. 138 to 146 (even numbers only), Cambridge-road, Bethnal Green, at less than the prescribed distance from the centre of Pelican-passage (Mr. A. Hood).—Refused.

St. George, Hanover-square.—An iron and glass shelter at the entrance to the Premier Hotel, Dover-street, Piccadilly (Mr. G. W. Aylmore for Mr. W. G. Hornsey).—Refused.

Westminster.—A deviation from the plan sanctioned on February 20, 1900, for the erection of a drill hall and headquarters on the west side of Regency-street, Westminster, to abut also upon Chapter-street and Frederick-street, by the absorption of an additional piece of land from the public way (Mr. W. C. Waymouth for the Electrical Engineer Volunteer Corps).—Refused.

Line of Frontage and Space at Rear.

St. Pancras, East.—The erection, on the site of No, 69, Euston-square and Nos. 172 and 174, Euston-road, St. Pancras, of a fire-brigade station with a projecting pent and six-story bay window and an irregular space at the rear (Mr. O. Fleming for the Fire Brigade Committee of the Council).—Consent.

Width of Way and Space at Rear.

St. George-in-the-East.—That the application of Mr. E. Crosse on behalf of Mr. E. Gibbs, for an extension of the periods within which the erection of three four-story blocks of dwellings adapted to be inhabited by persons of the working class, with four one-story shops, on the sites of Nos. 2 to 22 (even numbers only), John-street, and premises at the rear in Marmaduke-court, St. George-in-the-East, was required to be commenced and completed, be granted.—Agreed.

Width of Way and Construction of Buildings.

Rotherhithe.—Four iron sheds at Messrs. Quirk, Barton & Co.'s lead works, Rotherhithe-street, Rotherhithe (Messrs. Croggon & Co., Limited, for Messrs. Quirk, Barton & Co.)—Consent.

Kensington, North.—A temporary wood and iron shed in the garden at the rear of No. 28, Holland-park-avenue, Kensington, at less than the prescribed distance from the centre of Ladbroke-terrace-mews (Mr. J. C. Inglis).—Consent.

Bow and Bromley.—Four iron gangways acros Fawe-street, Poplar, to connect warehouses on the opposite sides of that street (Mr. Max Clarke for Messrs. Spratt's Patent, Limited).—Refused.

Wandsworth.—A temporary wooden infirmary building on land adjoining the Wandsworth and Clapham Convalescent Home, situated between Church-lane and Rectory-lane, Tooting, with the forecourt boundary or fence at less than the prescribed distance from the centre of Church-lane (Mr. C. A. Sharp for the Guardians of the Wandsworth and Clapham Union).—Refused.

Wandsworth.—The retention of four wood and iron sheds in the yard at the rear of No. 2, Kempsell-cottages, Worple-road, Putney, at less than the prescribed distance from the centre of Elizabeth-place (Mr. F. J. Jee).—Refused.

Formation of Streets.

Hammersmith.—That an order be issued to Mr. T. Athey, sanctioning the formation or laying out of a new street for carriage traffic to lead from Hamlet-gardens to Ravenscourt-park, Hammersmith (for Mr. W. H. Gibbs). That the name Hamlet-gardens (in continuation) be approved for the new street.—Agreed.

Lewisham.—A variation from the plan sanctioned by the Council on March 7, 1899, for the formation or laying out of a portion of Adamsrill-road, Perry-hill, Catford, so far as relates to a deviation in the position of that road (Mr. A. J. Dorrell).—Consent.

Dwellings for the Working Classes.

Hammersmith.—That the Council do make an order as follows:—Whereas Messrs. N. S Joseph, Son, & Smithem, of Moorgate Station-buildings, 45, Finsbury-pavement, E.C., on March 31, 1900, under the provisions of Section 42 of the London Building Act, 1894, delivered, on behalf of the Guinness' Trust, at the County Hall, a plan marked "A" of three blocks of intended dwelling-houses, to be inhabited by persons of the working class and proposed to be erected, not abutting upon a street, on a site on the east side of Fulham Palace-road, Hammersmith, between the Victoria Laundry and the Metropolitan District Railway . . . . the Council does by this order sanction the said plan marked "A" so far as Section 42 of the said Act is concerned. . . . . —Agreed.

Buildings for the Supply of Electricity.

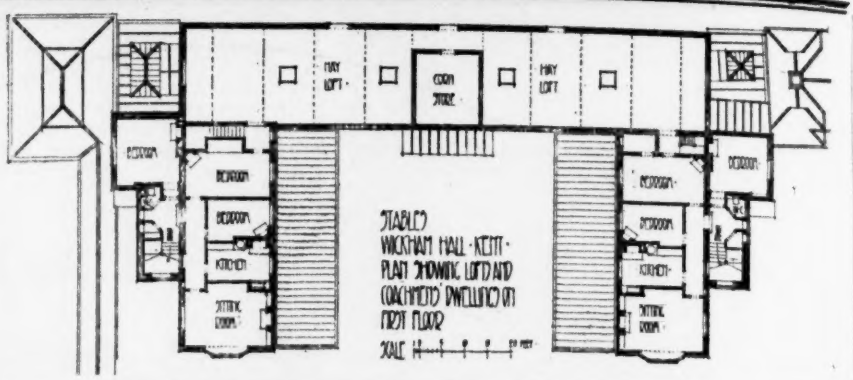
St. George, Hanover-square.—For alterations and additions to the generating station and works of the Westminster Electric Supply Company, Limited, at Eccleston-place, St. George, Hanover-square (Mr. C. S. Peach).—Consent.

Separation of Buildings.

Fulham.—The formation, on the ground floor, of an opening in the party wall between Nos. 11 and 12, Salisbury-pavement, Dawes-road, Fulham, without making the buildings, when considered as one building, in conformity with the provisions of the Act (Messrs. H. and E. Lea).—Refused.

Illustrations.

STABLES AND FARM BUILDINGS, WICKHAM HALL, KENT.



THESE buildings were erected a year or two ago, substantially as shown in the accompanying illustration—with the exception of the central dog kennel.

The stables and cow-houses are lined entirely in glazed bricks from floor to ceiling, the doors being of oak, and the harness-room fittings of teak.

Externally, the walls are finished in lias lime rough-cast, with dressings of salt-glazed bricks, the roofs being covered with green slates.

The stable fittings are by Messrs. Musgrave & Co.

Messrs. Moreland supplied the constructive ironwork, and Messrs. Mellowes the patent glazing. Messrs. Candler & Sons were the builders, and Messrs. Millard & Pryce the architects.

BOTANICAL LABORATORIES, GLASGOW UNIVERSITY.

THE above buildings are situated in the open grounds to the west of the main University buildings and facing University-avenue on the north and the athletic grounds on the south.

The main entrance is from University-avenue, and gives access to a central hall, lighted by a cupola over the staircase and rising 19 ft. to the ceiling, round which are grouped the lecture theatre, museum, herbarium, and professor's rooms.

The lecture theatre is open to the roof, and finished with a plaster ceiling. It faces south, and has a bay window for plants, with a conservatory on the roof over. It measures 54 ft. by 36 ft. and is seated for 213 students. The museum is similarly roofed, measuring 52 ft. by 35 ft., and has two galleries. The herbarium measures 40 ft. by 35 ft., and rises the full height of hall, with one gallery, the entresol space over the professor's room being used for assistants' private rooms.

The first floor, over the herbarium and central hall, is occupied by the elementary laboratory (65 ft. by 35 ft.), with working accommodation for 100 students, and over the professor's room, by the advanced laboratory (27 ft. by 35 ft.). These laboratories are open to the roof with ceilings in plaster, and lighted by roof-lights from the north.

The buildings are of Bishopbriggs grey sandstone, square dressed subble, with scabbled hewing, and the roofs of Lancashire blue slates. The work is intended to combine the styles of the old Scotch gateway adjoining, and the University buildings proper.

The contractors are:—For masonry work, Messrs. Alexander Muir & Sons; for wrought work, Messrs. J. Herbertson & Son; for slating work, Messrs. A. M. Ross & Sons; for plumbing work, Messrs. Fyfe & Allan, Limited; for plastering work, Messrs. Geo. Rowe & Co.; for heating and ventilation, Messrs. J. Cormack & Sons; all of Glasgow. Mr. Thos. Douglas acts as clerk of works.

The estimated cost of the buildings is about 18,000*l.*

The building is the joint design of Mr. J. Oldrid Scott (London) and Mr. J. J. Burnet (Glasgow), and is being carried out under the immediate supervision of Mr. Burnet.

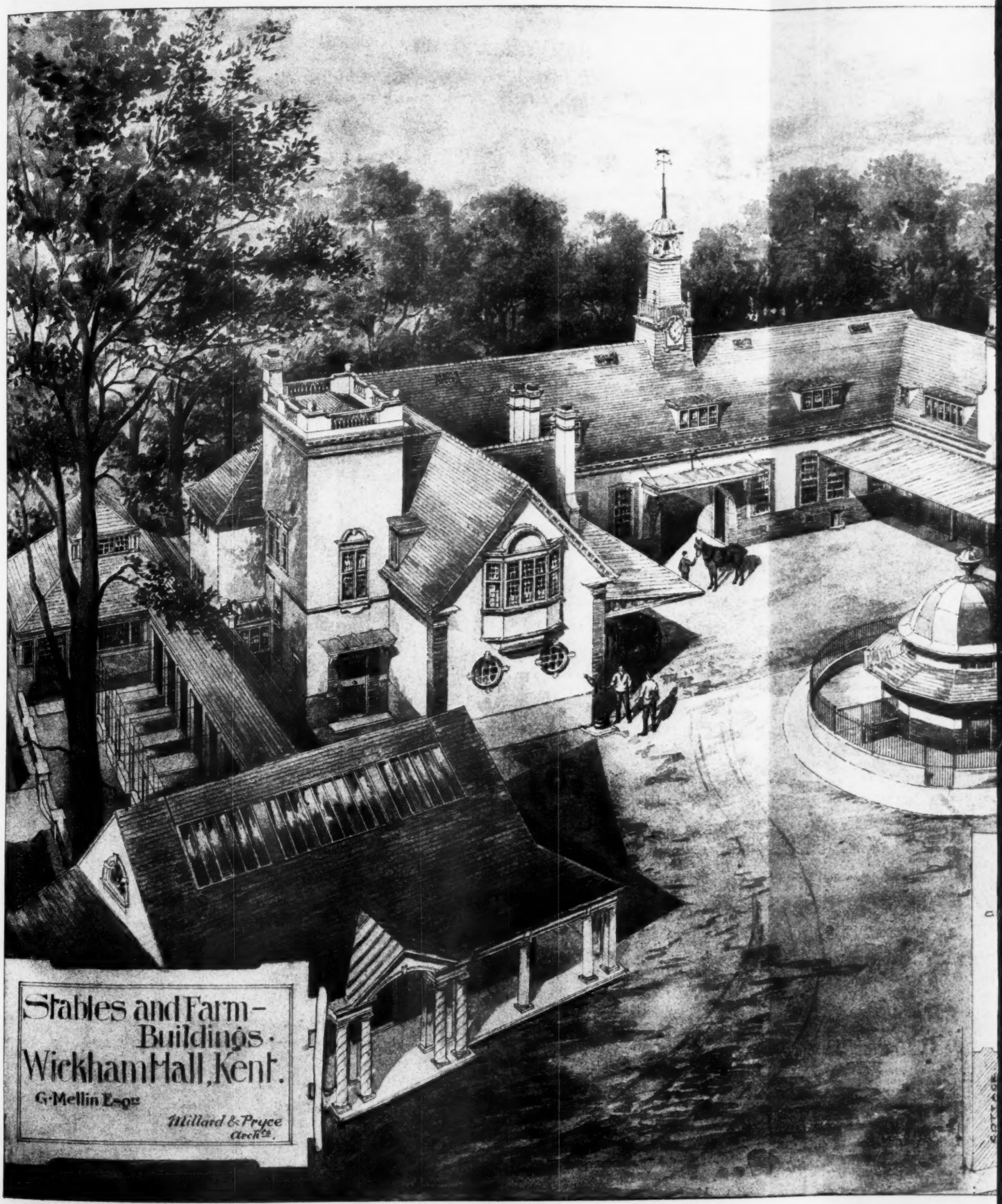
WREN'S COLONNADE, HAMPTON COURT PALACE.

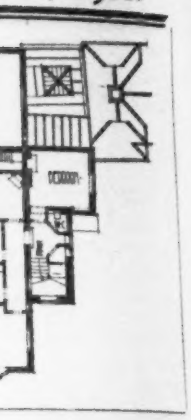
THIS beautifully-proportioned colonnade forms the approach to the King's Great Staircase, and is situated on the south side of the Second or Clock Court, at Hampton Court Palace, and opposite the Great Hall. It forms one of the most interesting portions of Wren's work at the Palace.

In the midst of Tudor surroundings, it has been considered on that account to be out of place; it is, nevertheless, an ornament to the courtyard, and forms a mask to an irregular, though picturesque, block of buildings of Wolsey's time which are seen above the parapet.

The colonnade, which is of Portland stone, consists of seven couples of Ionic columns with very fine caps, and pilasters of the same order at either end against the wall, supporting an entablature and balustrade on the top. Over the two central columns are large carved vases of stone, upon which are worked the initials of William and Mary, and under these are ornaments of foliage, masks, and trophies of war, worked in very high relief.

William Emmett, the celebrated carver, was employed at this time at the Palace, and it is most probable that the vases and trophies over


Stables and Farm-
Buildings.
Wickham Hall, Kent.
G. Mellin Esqre
Millard & Pryce
Archts.



TORIES, GLASGOW
RSITY.

re situated in the open
the main University
iversity-avenue on the
ounds on the south.
is from University-
ess to a central hall,
the staircase and rising
nd which are grouped
seum, herbarium, and

s open to the roof, and
ter ceiling. It faces
y window for plants,
on the roof over. It
. and is seated for 213
m is similarly roofed,
t., and has two galleries.
res 40 ft. by 35 ft., and
hall, with one gallery,
er the professor's room
ts' private rooms.
he herbarium and central
e elementary laboratory
vorking accommodation
er the professor's room,
ratory (27 ft. by 35 ft.).
open to the roof with
d lighted by roof-lights

Bishopbriggs grey sand-
subble, with scabbled
of Lancashire blue slates.
d to combine the styles
eway adjoining, and the
roper.
e :—For masonry work,
ir & Sons ; for wrought
ertson & Son ; for slating
oss & Sons ; for plumbing
& Allan, Limited ; for
ssrs. Geo. Rowe & Co. ;
ation, Messrs. J. Cormack
gow. Mr. Thos. Douglas

of the buildings is about

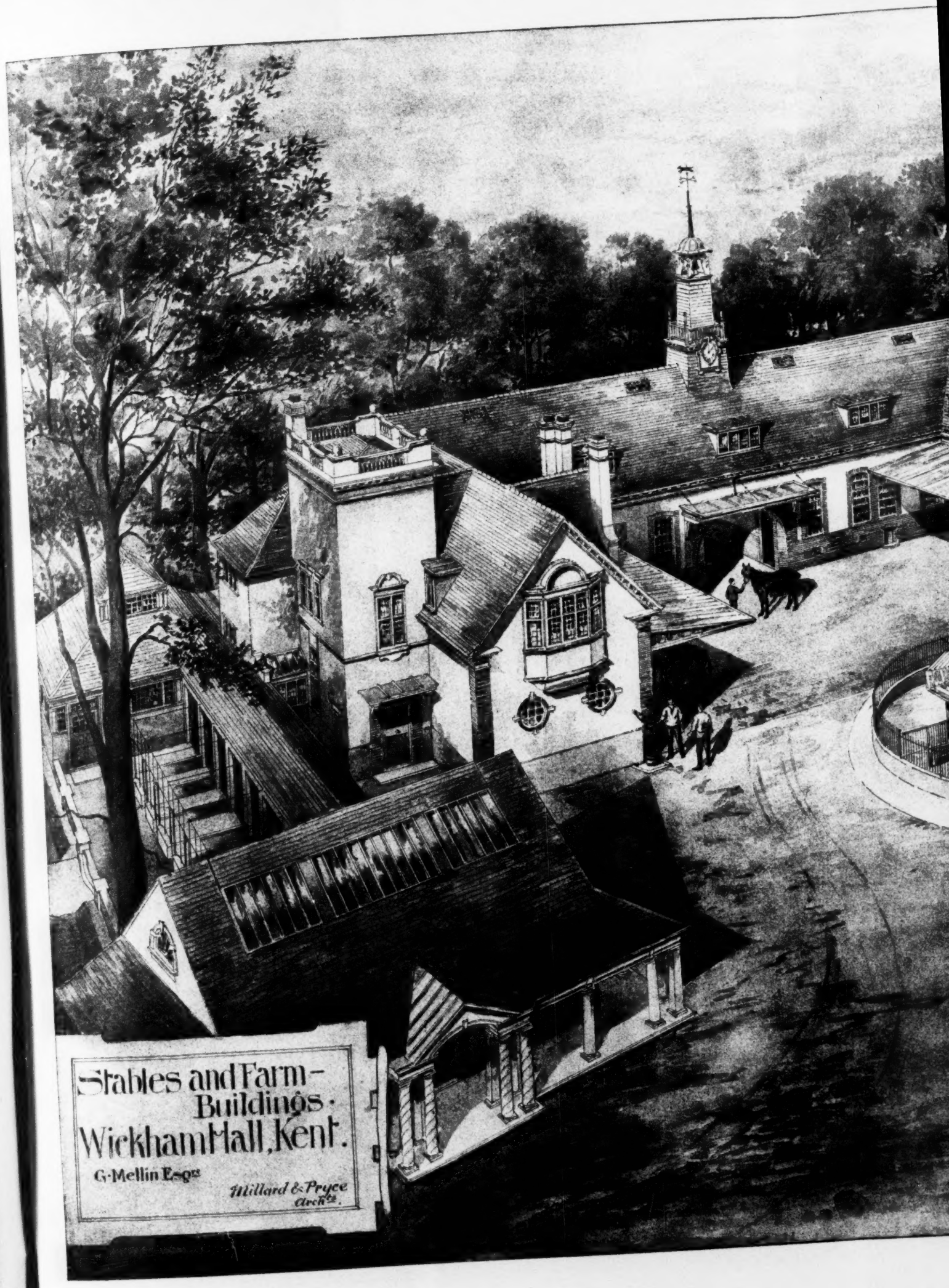
he joint design of Mr. J.
on) and Mr. J. J. Burnet
ng carried out under the
n of Mr. Burnet.

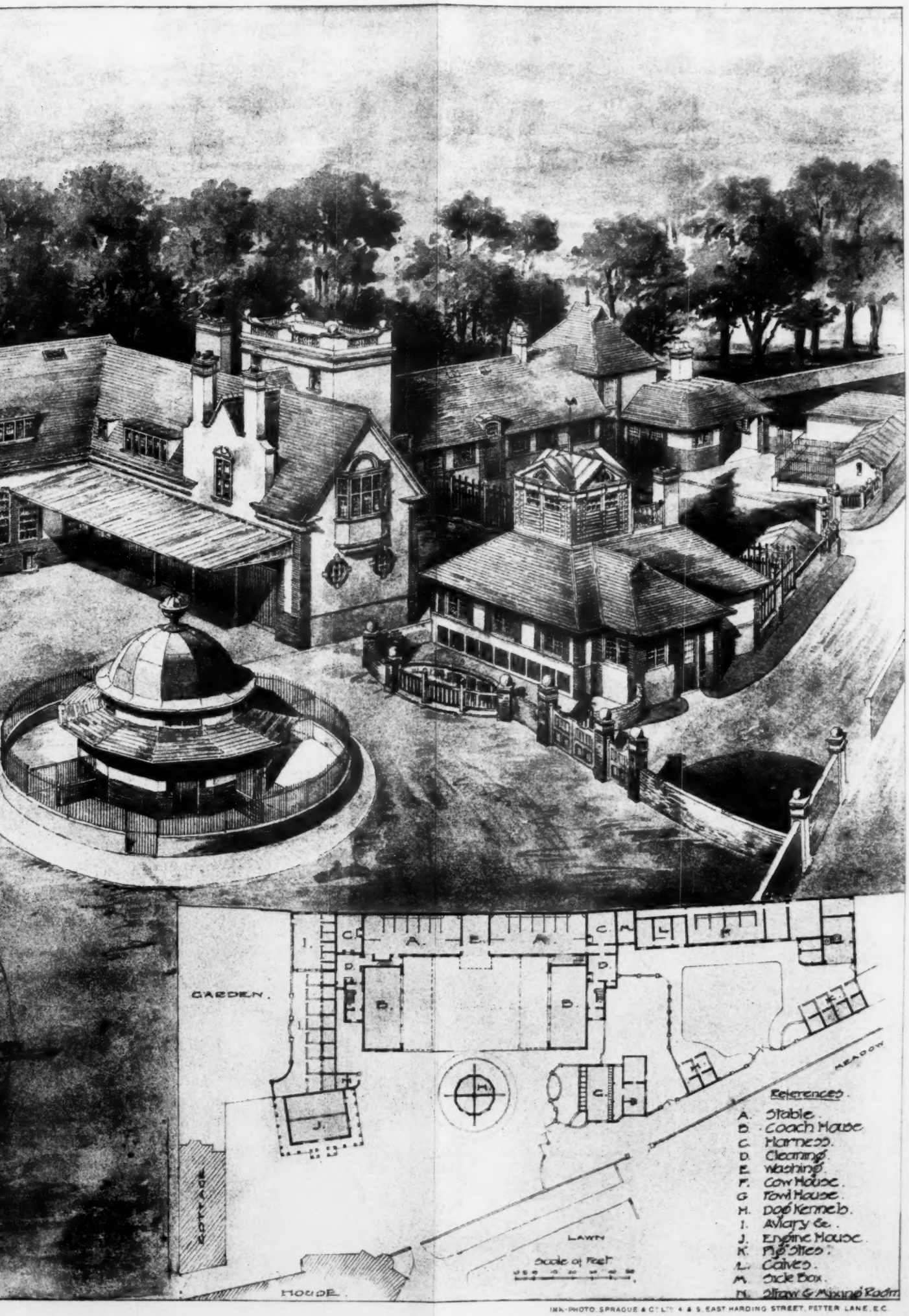
NNADE, HAMPTON
T PALACE.

proportioned colonnade
h to the King's Great
ated on the south side of
Court, at Hampton Court
the Great Hall. It forms
esting portions of Wren's

dor surroundings, it has
that account to be out of
less, an ornament to the
s a mask to an irregular,
block of buildings of
ch are seen above the

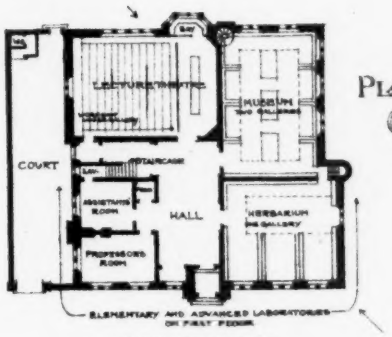
ich is of Portland stone,
les of Ionic columns with
asters of the same order
the wall, supporting an
strade on the top. Over
ns are large carved vases
are worked the initials of
d under these are orna-
sks, and trophies of war,
relief.
e celebrated carver, was
e at the Palace, and it is
vases and trophies over





INK-PHOTO. SPRAGUE & Cº LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

GLASGOW · UNIVERSITY · EXTENSION ·
NEW BOTANICAL LABORATORIES



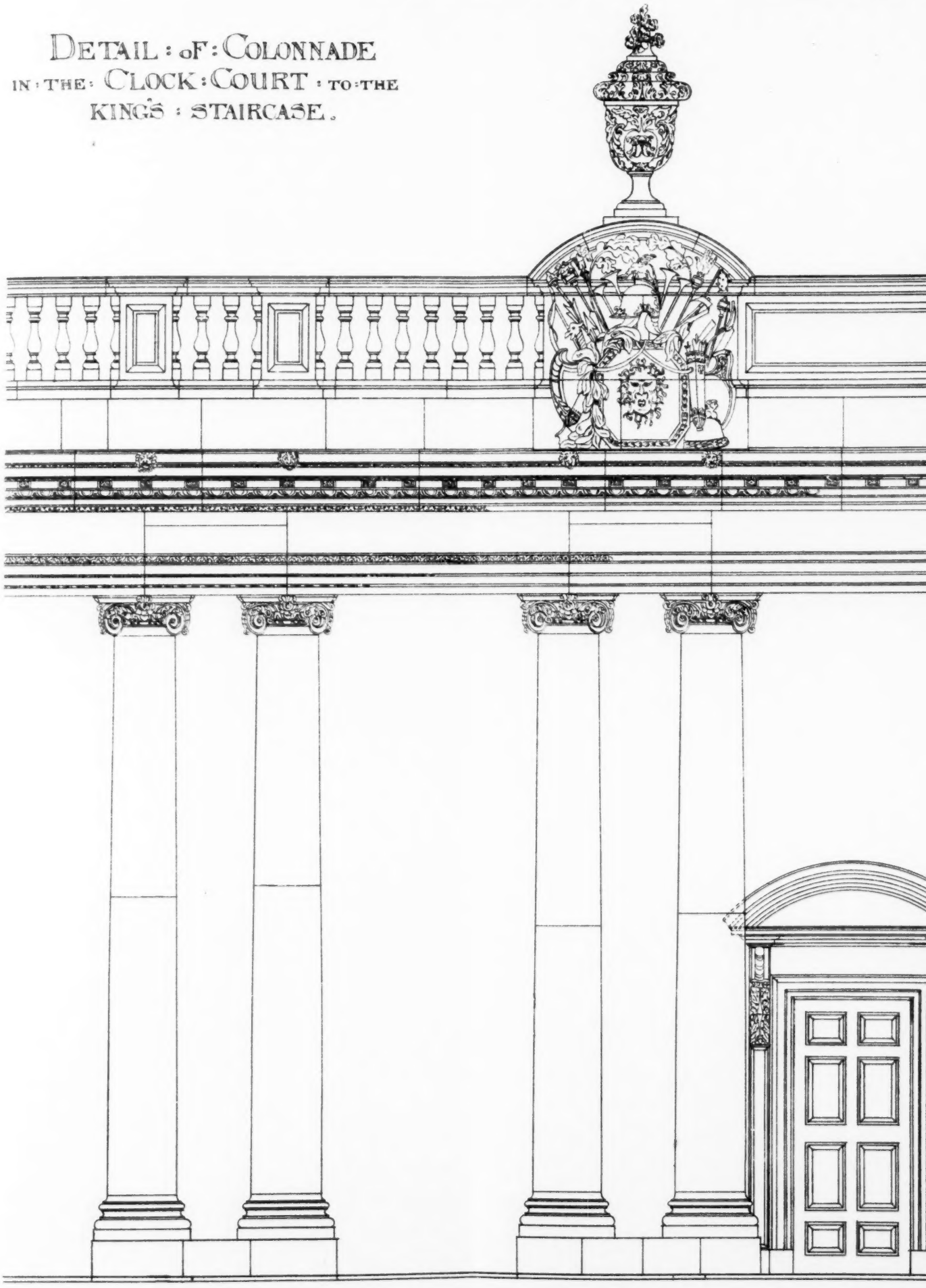
PLAN OF
GROUND FLOOR

JOHN OLDRID SCOTT
JOHN JAMES BURNET } JOINT ARCHTS

PHOTO-LITHO SPRAGUE & Co LTD 4 & 5 EAST HARDING STREET, FETTER LANE E.C.

HAMPTON · COURT

DETAIL : OF : COLONNADE
IN : THE : CLOCK : COURT : TO : THE
KING'S : STAIRCASE.



URT · PALACE.

SCALE · OF · FEET.

INCHES 3 FEET

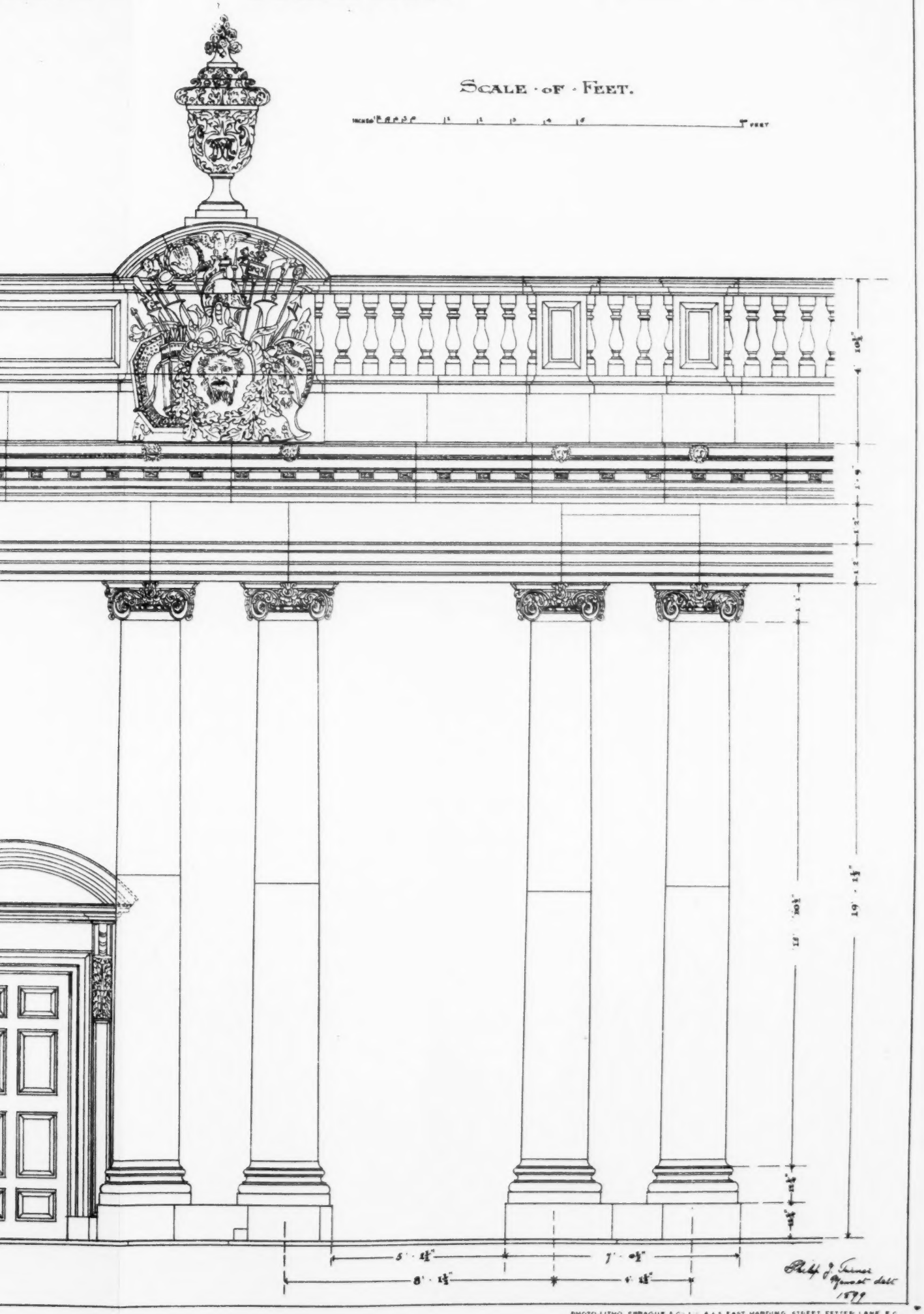


PHOTO-LITHO SPRAGUE & C° LT° 4 & 5 EAST HARDING STREET FETTER LANE E.C.

HAMPTON · COURT · PALACE.

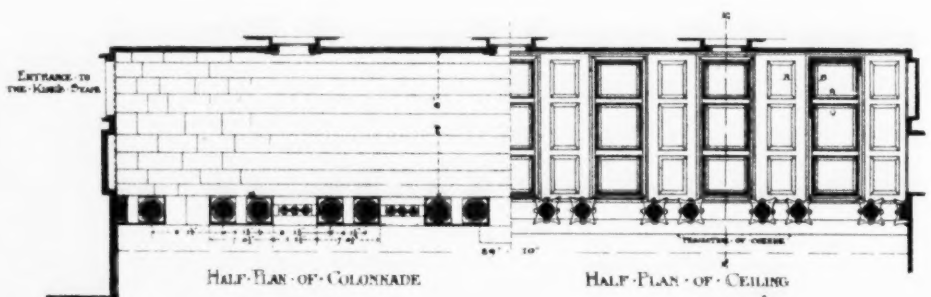
COLONNADE · IN · THE · CLOCK · COURT To · KING'S · ENTRANCE.

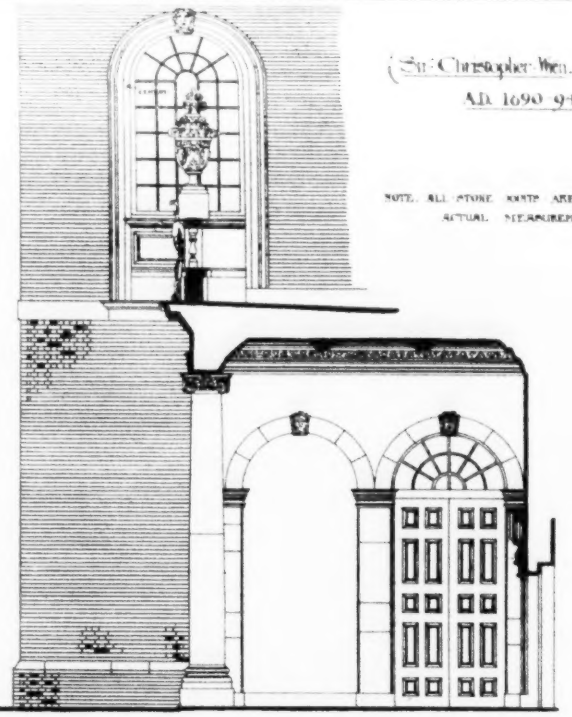
(Sir Christopher Wm. Archt)
AD 1690-94

NOTE. ALL STONE JOINTS ARE FROM ACTUAL MEASUREMENT

SCALE FOR PLAN.

SCALE For SECTION And ELEVATION.





SECTION A.B.

ELEVATION

COLONNADE
TO
KINGS ENTRANCE

SECTION

SECTION
(Main Cornice.)

MAIN · CORNICE

SOFFIT
OF
CORNICE.

PANEL MOULD.

COLONNADE
TO
KINGS · ENTRANCE.

SECTION
RIB C.D.

CORNICE TO CEILING.

SECTION OF RIB A.B.

LINE OF ARCHITRAVE

PLAN OF ABACUS.

ELEVATION · OF · CAP

SECTION
OF
BALUSTRADE.

BASE
TO
COLUMNS.

TOP OF MAIN CORNICE

HEAD

IMPOST
TO
ARCH

ARCH
MOULD.

12"

ARCHITRAVE TO WINDOW.

Scale.

Philip J. Turner
Year of date
1899

PHOTO LITHO SPRAGUE & Co. Ltd 4 & 5 EAST HARDING STREET FETTER LANE E.C.

the cornice were executed by him, doubtless under the supervision of Grinling Gibbins.

The illustration is from measured drawings by Mr. Philip J. Turner.

WORKING RULES FOR CARPENTERS AND JOINERS IN THE LONDON DISTRICT.

THE following is the agreement as to rules which has just been arrived at between the representatives of the London Master Builders' Association and the Carpenters' and Joiners' Societies :—

N.B.—Throughout these rules 'employer' means a member of the London Master Builders' Association, and 'workman' means a member of a Carpenters' and Joiners' Trade Society.

1. That the working hours in summer shall be fifty per week for forty weeks.

That during twelve weeks of winter, commencing on the second Monday in November, the working hours shall be for the first three weeks and the last three weeks forty-seven hours per week, and during the six middle weeks forty-four hours per week.

Hours of Labour.—(Summer, for forty weeks.)—First five days of each week, 6.30 a.m. to 8 a.m., 8.30 a.m. to 12 noon, 1 p.m. to 5 p.m.; Saturdays, 6.30 a.m. to 8 a.m., 8.30 a.m. to 12 noon. Equal to fifty hours per week. (Winter, for twelve weeks.)—For three weeks commencing the second Monday in November: first five days of each week, 7 a.m. to 8 a.m., 8.30 a.m. to 12 noon, 12.30 p.m. to 4.30 p.m.; Saturdays, 7 a.m. to 8 a.m., 8.30 a.m. to 12 noon. Equal to forty-seven hours per week. For the next six weeks: first five days of each week, 8 a.m. to 12 noon, 12.30 p.m. to 4.30 p.m.; Saturdays, 8 a.m. to 12 noon. Equal to forty-four hours per week. For the following three weeks: first five days of each week, 7 a.m. to 8 a.m., 8.30 a.m. to 12 noon, 12.30 p.m. to 4.30 p.m.; Saturdays, 7 a.m. to 8 a.m., 8.30 a.m. to 12 noon. Equal to forty-seven hours per week.

Joiners in shops to have one hour for dinner throughout the year.

2. That the present rate of wages shall be advanced one halfpenny per hour from May 1, 1900.

3. That overtime, when worked at the request of the employers, shall be paid at the following rates, namely :—From leaving-off time until 8 p.m., time and a quarter; from 8 p.m. to 10 p.m., time and a half; after 10 p.m., double time. No overtime shall be reckoned until each full day has been made, except where time is lost by stress of weather. On Saturday the pay for overtime, from noon to 4 p.m., shall be time and a half; after 4 p.m., and Sunday, double time. Christmas Day shall be paid for the same as Sunday.

4. That one hour's notice be given or one hour's time be paid by either side on determining an engagement. All wages due shall be paid at the expiration of such notice, or walking time if sent to yard. All workmen, who are in receipt of full wages, and who have been employed for not less than forty-two hours, shall, on discharge, receive one hour's notice, to be occupied, so far as is practicable, in grinding tools, with one hour's pay in addition.

In the event of more than 10 per cent. of the workmen of the trade employed at the job giving notice to leave during any one day (except Saturday), they shall not be entitled to receive their money until noon on the following day.

5. That men who are sent from the shop or job, including those engaged in London and sent to the country, shall be allowed as expenses 6d. per day for any distance over six miles from the shop or job, exclusive of travelling expenses, time occupied in travelling, and lodging money.

6. That payment of wages shall commence at noon, or as soon thereafter as practicable, on Saturday, and be paid on the job. But if otherwise arranged, walking time at the rate of three miles per hour to get to the pay table at twelve noon.

7. That employers shall provide, where practicable and reasonable, the following conveniences :—(*a*.) A suitable place for the workmen to have their meals on the works, with a labourer to assist in preparing them. (*b*.) A lock-up where tools can be left at the owner's risk. (*c*.) A grindstone for the use of workmen.

8. That wages earned after leaving-off time on Friday and Saturday only shall be kept in hand as back time.

9. That the term "London District" shall mean twelve miles radius from Charing Cross.

10. (*a*) For the adjustment of all disputes and to avoid stoppage of work, it is agreed that upon a difference arising between an employer or upon the works of an employer and any of his workmen from any cause whatever, notice shall be given by the association or society of the complaining party to the association or party representing the other side and the subject matter of dispute shall thereupon be referred to the Board of Conciliation who shall be summoned within seven days, and, if practicable, shall give their decision within the next six working days, proceeding in the following manner :—

(*b*) For all purposes of the foregoing rules the Board of Conciliation shall consist of three members nominated by the employers and three by the workmen. Each party shall send to the other within one week from the date of signing these rules and within one week from January 1 in each year, the names of six persons from whom three shall be selected to act as their representatives on the Board of Conciliation for the current year ending December 31, and in the event of death or resignation of any member, either party shall appoint another member within one week, notice being given thereof. The number of representatives of the employers and of the workmen on the Conciliation Board shall always be equal and shall be so maintained during the sitting.

(*c*) The Board of Conciliation so constituted if unable to agree shall make application to the Board of Trade under the "Conciliation Act, 1896," or apply for the appointment of a person to act as conciliator. The Board of Conciliation shall have power to decide all questions arising between the employer and the workmen, including any questions between one trade and another as regards demarcation of labour or other matters, provided that for the decision of any question involving claims or rights of other sections of the building trades a Joint Conciliation Board shall be constituted of the three representatives nominated by each trade involved and by a similar number of representatives of the employers, so that members on the Joint Conciliation Board may be specially represented on such Board, and so that the numbers of representatives of the employers and the workmen on such Joint Conciliation Board shall be equal and so maintained during the sitting.

(*d*) A Joint Conciliation Board shall have the like powers as a Conciliation Board, and be regulated in the same manner.

(*e*) The Conciliation Board or a Joint Conciliation Board shall have power to make such rules and regulations for the transaction of business as they may approve.

(*f*) In the event of an application being made to the Board of Trade or a person being appointed as conciliator, the decision of such person or the Conciliation Board shall be final and binding on both parties.

11. That six months' notice on either side shall terminate the foregoing rules.

(It is understood that the six months' notice shall not expire during the winter weeks.)

Signed on behalf of the carpenters and joiners, Thursday, April 19, 1900 :—W. M. Thomson, A. Joliffe, A. W. Raynor, Charles Childs, W. F. Dean, J. Dixon, James Webster, J. T. Stobart, J. Miles, W. Randall, E. T. Jessup, R. Rust (Secretary).

Signed on behalf of the London Master Builders' Association, Thursday, April 19, 1900 :—Charles Wall (President London Master Builders' Association), Thomas Gregory, Frank May, William Shepherd, Ernest J. Brown, Thomas Costigan (Secretary).

Correspondence.

To the Editor of THE BUILDER.

LABOUR IN THE BUILDING TRADE.

SIR,—I see that the carpenters and joiners are asking for an advance in wages, and that the masters have offered ½d. an hour. I hope this opportunity will be taken of making some agreement with the trades-unions; either to allow piecework with a specified minimum price, or to define the quantity of work a fully-qualified mechanic will guarantee to do in a certain time.

At present it is quite impossible for a builder to say what the labour on any piece of work will cost him, and yet he has to complete his contract for a fixed price. It is this uncertainty which causes the very high prices in building at present, and which has stopped a large amount of work. In America higher wages are paid than in England, and yet American firms can supply steel rails, &c., more cheaply than English firms, simply because the men work faster and are more skilled. Builders will never be safe from making heavy losses on contracts until they know with certainty how much work a man will do in a certain time. At present the only certainty is, that however badly and slowly a man may work, if he is called a mechanic by the trades-unions, a builder must pay him the full rate of wages. A good workman finds that a man who is turning out half the work that he is doing is paid just as much, so he naturally has no inducement to do any better. This question will have to be faced if England is to keep her trade, and the sooner it is settled the better for every one, including the mechanics themselves. As work seems likely to become more slack, especially if the war be prolonged, it is a good time to arrange matters on a more satisfactory basis, and I hope the Master Builders' Association will make an effort to do so.

G. M. NICHOLSON.

PENALTIES FOR UNFINISHED CONTRACT.

SIR,—What is the usual practice with architects when granting their final certificate for work done under a contract which states that the work should be finished at a certain time under a penalty, and the work is not completed in the stated time? Is it proper for the architect to advise the proprietor as to the amount of the penalty and ask him whether he wishes to enforce it, or to grant his final certificate deducting therefrom the amount of the penalty, without having the opinion of the proprietor. OMEGA.

*** In our opinion the architect should advise his client in regard to the liability of the contractor to a penalty, and act on his instructions. That is his duty to his client; and his duty to the contractor will be to call attention to any special circumstances—such as an unexpected strike or an unusual run of bad weather—which might stand as a valid excuse for the whole or part of the delay, and under those circumstances to suggest or arrange a compromise which will be fair to both parties.—ED.

Books.

Notes on the Early Sculptured Crosses, Shrines, and Monuments in the Diocese of Carlisle. By the late Rev. W. S. CALVERLEY, F.S.A.; edited by W. G. COLLINGWOOD, M.A. R. T. Wilson, Kendal. 1899.

OWING to the untimely death of Mr. Calverley, this long-planned book presents a somewhat scrappy appearance, and is not the well-welded whole which it would have been had his life and health been prolonged. Nevertheless, Mr. Collingwood has done his share of the work, as a friend and brother expert, with considerable skill, and the broad result is the issue of a volume of considerable value to the antiquary and the ecclesiologist. Mr. Collingwood—so well known as a Ruskin student—has adopted the plan of printing his share of the work in somewhat smaller type, so that the different authors can be readily detected. From 1880, down almost to the time of his death in 1898, Mr. Calverley contributed year by year excellent and carefully illustrated papers on the pre-Norman sculpture of Cumberland to the "Transactions of the Cumberland and Westmoreland Antiquarian Society," and occasionally to other journals. It was his ambition to gather these together, to re-edit them, and to fill in the gaps, but that work had mainly to be done by another. It was Mr. Calverley who, in 1882, first started the theory of the "pagan overlap" in our early Christian sculpture—a theory which was then received with some scepticism, but which was afterwards fully established, and thoroughly accepted and corroborated by such a painstaking authority as the present Bishop of Bristol. The first exposition of this theory was made at Carlisle, at the summer meeting of the Royal Archæological Institute in 1882, when some of the remarkable carvings on the great Christian cross at Gosforth were interpreted as Edda-myths. Scandinavian legends have since been traced on the Christian crosses in the parish church at Leeds, and at Kirk Andreas, in the Isle of Man. Year after year Mr. Calverley was able to adduce new and substantial proof of the genuineness of this theory of the blending of pagan legend with Christian truth. One of the last instances of this was in the lecture he delivered to the Lancaster Philosophical Society in 1891, when he interpreted the Völsung-myth on the cross at Halton.

Those who know little or nothing of the churches and churchyards of Cumberland will probably be much surprised at learning the great number, the artistic beauty, and the infinite diversity of the early Christian sculptured crosses or fragments that are to be found in that county, and which are here described and faithfully illustrated throughout the whole series. The volume is arranged alphabetically; it opens with the parish of Addingham, and closes with that of Workington—a list that comprises upwards of sixty different localities, many of them having several examples. One of Mr. Calverley's favourite statements was, that the monuments of Cumbria still bear witness to the fact that there was a continuous Christian Church at work there, century by century, ever since the days of the Romans. This book goes far to prove the literal truth of what was at one time considered too vague and credulous an assertion.

Art in Needlework: a Book about Embroidery. By LEWIS F. DAY. London: B. T. Batsford. 1900.

THIS book by Mr. Day is essentially a practical book for the embroideress, and will prove of great use to the artistic needlewoman. The author gives his views as to what embroidery is in his preface. "The custom has been," he says, "since women learnt to kill time with the needle, to think of embroidery too much as an idle accomplishment. It is more than that. At the very least it is a handicraft; at the best it is an art." No one who has seen the beautiful specimens of embroidery exhibited the last few years at the Arts and Crafts and at the South Kensington School of Art Needlework will deny this. If more women would take up embroidery instead of painting, we should have fewer bad pictures and more beautiful needlework. Needlework is a more natural art to a woman than painting, if one may use such an ambiguous term as a "natural art;" that is to say, that the use of the needle comes almost naturally to womankind, and, therefore, there is not the long up-hill toil, stretching over many years, of the art student in painting; and, though it requires a certain amount of artistic perception to be able to arrange colours and adapt stitches, the genius which is required to make a fine piece of embroidery is of a lower order than that required to paint a fine picture, and the art is within the reach of many who could not attain to the painting of pictures.

A feature in Mr. Day's book is the reproduction of the sampler, both front and back being given, so that it is perfectly easy for the worker who reads the instructions at the same time to learn all the stitches given. One very important point in the book is the necessity for the designer to understand something of the stitches and materials before making a design for needlework. We are glad to find that "cross stitch" is not condemned.

It is a "far cry" from the pink roses and violet pansies worked on canvas of thirty years ago to the artistic designs for cross stitch on pages 13 to 19. The materials are the same, only in one case there is design adapted to the limitations of the angular stitch; in the other an attempt was made to reproduce the softness of a painting of realistic flowers, without any regard to the fact that by reason of the canvas the stitches could only be square.

Some of the illustrations are very beautiful, particularly a delicate design in satin stitch worked by Miss Buckle, part of a design by Walter Crane, a piece of "cut work" in linen, a fine appliqué panel by Miss Keighley, and a beautiful "darning design" by William Morris.

The book is most carefully arranged with marginal notes on the different stitches, and a descriptive list of the ninety-four illustrations.

Iron Corrosion: Anti-Fouling and Anti-Corrosive Paints. By LOUIS EDGAR ANDÉS. Translated from the German by Charles Salter. (London: Scott, Greenwood, & Co. 1900.)

THIS is a very useful work, describing the various natural conditions which cause corrosion of iron, discussing the numerous methods of treatment which have from time to time been advocated for the preservation of iron, and enumerating the most important details of several official specifications relating to the treatment of ironwork by contractors drawn up by different Continental authorities.

These specification extracts are particularly interesting, and show that considerable diversity of opinion exists as to what constitutes the most suitable method of treatment. The following extract from the specification adopted by the United Association of German Architects and Engineers may be quoted as affording an indication of the manner in which architects and engineers associate on the Continent for mutual benefit, and of the conditions under which Continental contractors are called upon to carry out work:—

"Before putting together, the various parts must be freed from all impurities, rust and scale, the method of cleaning to be stated by the contractors when tendering, except where any particular method is prescribed by the special conditions, or the contractor desires to deviate from the latter. If chemical means are resorted to for this cleaning, the contractor is liable for any subsequent rusting due to carelessness in removing the acid. The parts (plates, rods, &c.) chemically cleaned must be painted over with thin, quick-drying linseed varnish whilst hot, immediately after cleaning, and kept under cover until the varnish is sufficiently dry. Before the covering paint is applied, notification must be given to the consumer so that he may first examine the ironwork; and it is only after the treatment necessitated by this preliminary acceptance of the goods, and repairing the defects in the coat of varnish, that the first coat of the particular paint stipulated in the contract may be laid on. All surfaces that are to be covered up by others must be painted before the parts are put together.

In the case of all interstitial spaces where water is liable to accumulate, the painting must be very carefully performed, and provision made for the draining away of the water through holes bored for the purpose. If the latter is impracticable, the spaces must be filled up as well as possible with asphalt putty, or some other suitable material."

The author concludes his book with directions for what he considers the best practical method of treatment. Generally speaking, the method recommended greatly resembles that adopted for the iron used in constructing the Forth Bridge (see the *Builder*, January 27, 1900, p. 77).

Iron is now so extensively employed in vital positions in constructive work of all descriptions that it is impossible to overrate the importance of acquiring a knowledge of all conditions liable to encourage corrosion, and of the means by which the material may be prevented from losing its strength when employed in positions where corrosion would naturally take place. The book before us deals with the subject in a manner at once practical and scientific, and is well worthy of the attention of all builders, architects, and engineers.

Spons' Architects and Builders' Price Book, with Useful Memoranda and Tables. By W. YOUNG, architect. Twenty-seventh edition. London: E. & F. N. Spon. 1900.

IN this work the sub-title ("Useful Memoranda and Tables") should, as this portion does in the body of the work itself, take a first place in the title; as until it has been thoroughly revised from beginning to end of the "price book" portion, the book for the purpose of "pricing" is practically valueless. Certainly there has been *some* revision since it was published in the old pocket-book form, but this has been of a very harmless nature in numerous cases. Comparing the twenty-seventh edition with the thirteenth, for example, it will be found that pages of the latter have been "lifted" bodily, prices and all, to do service for the latest edition. In fact, to a large extent it strikes one that the stereotyper has been considered a more important person than the reviser.

In some cases where the prices have been revised, the revision is not such as would meet the approval of those conversant with the subject. It will be a shock to most to hear that grey stocks have *increased* in price 5s. per thousand between 1898 and 1900 (page 176 in both editions).

Why brickwork in Roman cement should be given as it is on page 173, with half brick walls, trimmers, &c., while for Portland cement an extra price for bulk brickwork is all that is given, is incomprehensible, considering the present almost universal use of the latter in place of the former. This, however, with the extremely awkward disposition and arrangement of the items generally throughout this portion of the book, appears to arise largely from the wholesale "lifting" from the earlier editions previously mentioned. There ought to be some sequence in the arrangement so that it should not be necessary to refer to the index for the leading items.

The "Useful Memoranda and Tables" continue to answer their purpose, as in such matters of stern fact revision is not necessary, and it is this portion of the work that makes it a useful book of general reference; but as a price book we do not think it will be found of any real value. The pricing portion should either be thoroughly revised from beginning to end or entirely eliminated, and the work boldly appear under its sub-title only. In its present form one edition is practically as good as another, and there is no excuse for it being republished annually.

CHOIR STALLS, ST. MATTHEW'S CHURCH, NOTTINGHAM.—New choir stalls of oak have been erected in the chancel of St. Matthew's Church, Nottingham. They were designed by Mr. A. N. Bromley, of Nottingham, and were made by Messrs. J. Hutchinson & Son, of Nottingham.

The Student's Column.

DETAILS OF STRUCTURAL IRON AND STEEL.

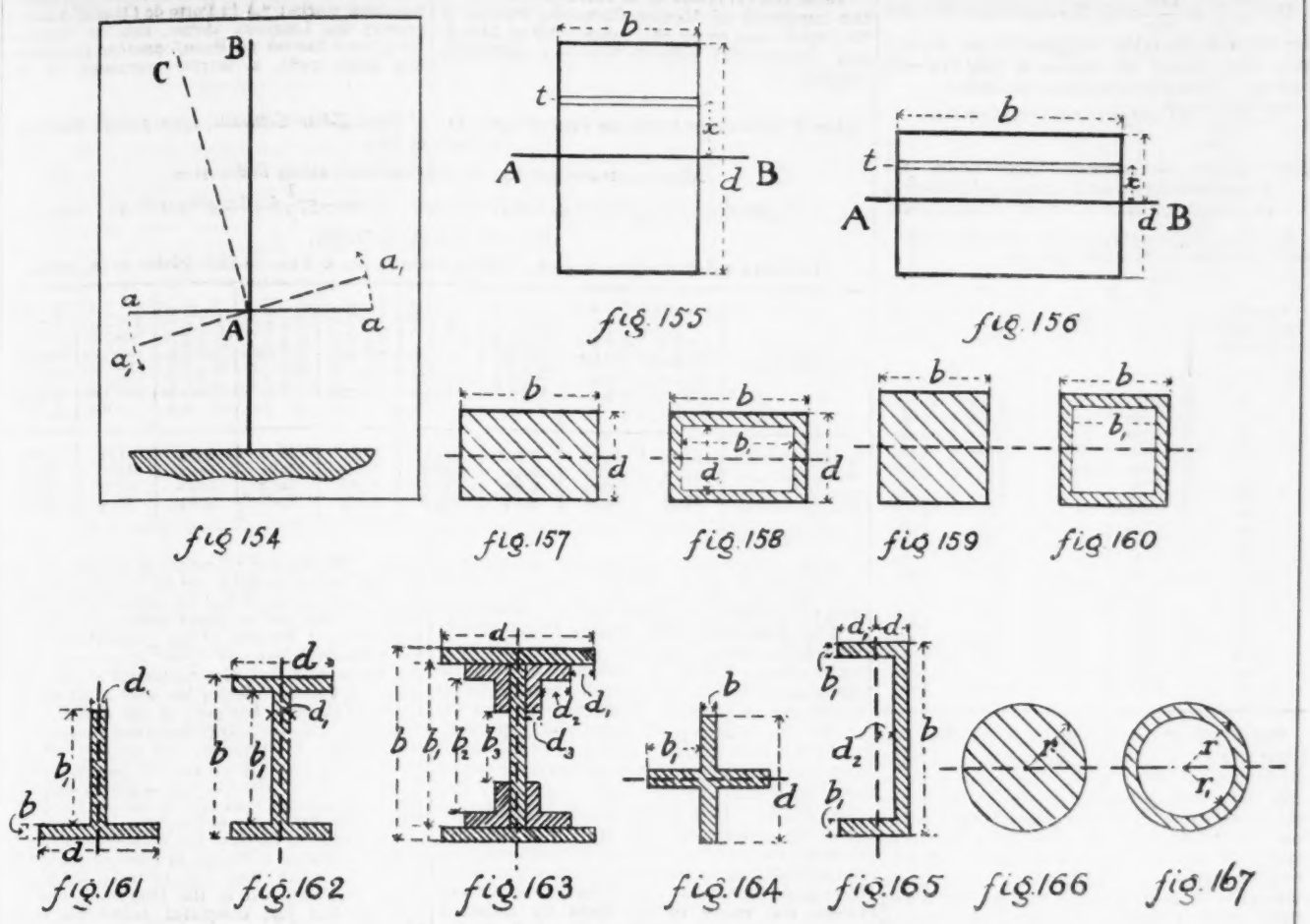
16.—THE STRENGTH OF COLUMNS (*continued*).

IN order that the meaning of the term *radius of gyration* may be duly appreciated, some acquaintance with fundamental mechanical principles is necessary. Gyration, or angular motion, is readily perceptible when exemplified in a machine or structure where a part is, and is intended to be, in visible motion about a given axis. It is not quite so easy to realise gyration as existing in the part of a structure which is intended to be motionless, and is apparently so. But the same principles apply to either case. For instance, if part of the axis A B, fig. 154, of a column be bent so that it assumes the position A C, the plane *a a* will rotate about the axis A, until it assumes the direction a^1 a^1, and incidentally there will be induced a state of compression in the fibres at one side, and of tension in those at the other. In a vertical column, bending under the influence of a load, motion of the plane surface constituting a transverse section must be considered in connexion with its axis. The *axis of rotation* is the imaginary line about which gyration takes place, and the *centre of gyration* is that point where the energy of gyration may be conceived to be concentrated.

The radius of gyration is the distance of the centre of gyration from the axis of rotation, and this radius, denoted by the symbol r, is used as the index to an effect producible in a given form of column section. Consideration must be given to inertia, that power by virtue of which matter tends to resist any change of state; and more particularly to the *moment of inertia*, because it is an index to the resistance afforded by a given form of column section to a change of state. As action and reaction are equal and opposite, so there is a definite relation between the radius of gyration and the moment of inertia of a given surface. Denoting the moment of inertia by I, and the area of the surface by A, the relationship is thus expressed:—$r = \sqrt{\frac{I}{A}}$ and $r^2 = \frac{I}{A}$. From this it appears that if the value of I is known, the values of r and r^2 can readily be ascertained. To find the moment of inertia of a rectangular surface, such as that represented in fig. 155, it is necessary to consider the surface to be made up of an infinite series of narrow areas parallel to the axis A B. Let t be the thickness of one such area, and x its distance from A B. Then its area is $b\,t$, and its moment of inertia with regard to A B $= b\,t\,y^2$. The moment of inertia of the whole rectangle equals the sum of the moments of the infinite series, or $\Sigma\, b\,t\,y^2$, the value of which is $\frac{b\,d^3}{12}$. If the breadth b and the depth d be expressed in inches, I will be found in inch units, and the moment of inertia in respect of an axis in the position and direction A B is said to be the vertical, or greatest, moment of inertia. In the rectangle shown in fig. 156 the moment of inertia in respect of the axis A B is much smaller, and is known as the horizontal, or least, moment of inertia. This is the moment which must always be taken when calculating the strength of a column, because the axis is that about which bending is most likely to occur.

Table XLI.—Least Moment of Inertia of Various Sections.

Reference.	Form.	Value of I.
Fig. 157	Solid rectangle	$bd^3 \div 12$
158	Hollow ,,	$(bd^3 - b_1 d_1^3) \div 12$
159	Solid square	$b^4 \div 12$
160	Hollow square	$(b^4 - b_1^4) \div 12$
161	T-section	$(bd^3 + b_1 d_1^3) \div 12$
162	Simple I-section	$\left.\begin{matrix} bd^3 - b_1(d^3 - d_1^3) \end{matrix}\right\} \div 12$
163	Compound I-section	$(b_2 d_2^3 - (b_1 2d_1^3 + b_2 2d_2^3 + b_3 2d_3^3) \div 12$
164	Cruciform section	$(bd^3 + 2b_1 d_1^3) \div 12$
165	Channel ,,	$(bd^3 - (b - 2b_1)d_2^3) + 2b_1 d_1^3 \div 12$
166	Solid cylinder	$\cdot 7854 r^4$
167	,, ,,	$\cdot 7854(r^4 - r_1^4)$



Illustrations to Student's Column.

Table XLII.—Value of r^2 for Various Sections (Rankine).

Form of Section.	$r^2 = \frac{I}{A}$
Solid rectangle, least side = h	$h^2 \div 12$
Thin hollow rectangle, breadth = b, height = h	$\frac{h^2}{12} \times \frac{h + 3b}{h + b}$
Solid square side = h	$h^2 \div 12$
Thin hollow square, side = h	$h^2 \div 6$
Solid cylinder dia. = h	$h^2 \div 16$
Thin hollow cylinder, dia. = h	$h^2 \div 8$
I-iron, breadth of flanges = b, flange area = A, web area = B.	$\frac{b^2}{12} \times \frac{A}{A + B}$
Channel-iron, depth of flanges + ⅓ thickness of web = h, area of web = B, of flanges = A.	$h^2 \left\{ \frac{A}{12 (A + B)} + \frac{A\ B}{4 (A + B)^2} \right.$

When the actual area of a surface is less than the product of its extreme breadth and depth, deduction must be made for the area included in these dimensions, which forms no part of the metal section. Modifications of the simple equation $I = \frac{b\,d^3}{12}$ are also necessary for calculating the value of I, in the cases of circular and of unequally formed sections. Table XLI. gives equations for the least moments of inertia of various sections, illustrated in figs. 157 to 167, relative to the axes there shown, and Table XLII. contains rules by which some values of r^2 may be approximately obtained in an expeditious manner.

Reverting to rules for calculating the strength of columns, we find that neither the Gordon nor the Rankine formula expresses experimental data with any marked precision, and results given by the two formulas are apt to exhibit considerable differences. It is not necessary to occupy space by comparative calculations, as the student can perform these at his leisure. The following typical examples are simply intended to illustrate the application of the rules.

Ex. 1. Find the breaking weight of a solid cylindrical column of cast iron with fixed ends, length 20 ft., diameter 6 in. :—

In Gordon's rule, $f = 36$ tons, $a = \cdot0025$, $S = 28\cdot27$, $l = 240$ in., $\left(\frac{l}{d}\right)^2 = 1{,}600$.

Hence,

$$P = \frac{36 \times 28\cdot27}{1 + (\cdot0025 \times 1{,}600)} = 203\cdot5 \text{ tons.}$$

Ex. 2. Find the breaking weight of a hollow cylindrical column of wrought iron with fixed ends, length 10 ft., diameter 5 in., thickness of metal, ·25 in. :—

In Gordon's rule, $f = 16$ tons, $a = \cdot00033$, $S = (19\cdot635 - 15\cdot904) = 3\cdot731$, $l = 120$ in., $\left(\frac{l}{d}\right)^2 = 576$.

Hence,

$$P = \frac{16 \times 3\cdot731}{1 + (\cdot00033 \times 576)} = 50\cdot1 \text{ tons.}$$

In Rankine's rule, $f = 16\cdot07$, $c = 36{,}000$, $l^2 = 14{,}400$, $r^2 = 3\cdot125$ (Table XLII.).

Hence,

$$P = \frac{16\cdot07 \times 3\cdot731}{1 + \frac{14{,}400}{36{,}000 \times 3\cdot125}} = 53\cdot1 \text{ tons.}$$

Conversely, if the breaking weight and length of a column are known, the proper diameter can be calculated; or if the breaking weight and the diameter are known, the length may be obtained. Factors of safety for cast and wrought iron columns were stated in Chapter 6, but these may have to be varied to suit individual cases. Moreover, it is desirable that the factor should be increased as the ratio of length to diameter increases.

If existing formulas are not perfect, those who use them have at least the satisfaction of knowing what they are doing, so far as may be, but when the strength of columns is found by the aid of tables, the inquirer frequently exhibits a degree of blind confidence which may or may not be justified. Tabular records published in this country as to experiments on columns are frequently more remarkable for antiquity than for applicability to modern requirements, and for some unknown reason British iron and steel manufacturers appear to think it desirable that practical details as to their goods should be withheld as much as possible. Ironfounders seldom, if ever, state dimensions from which the strength of their standard columns may be calculated. Similarly, steel manufacturers rarely publish more than the weights and over-all measurements of rolled sections, and even these dimensions are not often given for built-up sections. Everything, in fact, is left undone which would tend to encourage the use of standard productions, and everything is done which tends to confirm engineers in the habit of specifying special castings and special sections. In the United States, a very different practice is followed, and the handbooks of engineering firms contain such precise details and are of so comprehensive a nature, that they are actually used as text-books in more than one of the leading technical colleges. For the purpose of illustrating the mode of procedure adopted when such aids are available for the computation of strength, we append some tables taken from American sources.

Table XLIII.—Ultimate Strength of Hollow Cast Iron Columns (Birkmere) in pounds per square inch of sectional area.

Length ÷ diam.	Round.	Square.	Length ÷ diam.	Round.	Square.
5	73,300	76,200	17	46,444	50,700
6	73,400	74,610	18	44,200	48,540
7	71,272	72,660	19	42,100	46,460
8	68,970	70,930	20	40,000	44,450
9	66,533	68,850	21	38,100	42,510
10	64,000	66,670	22	36,300	40,650
11	61,420	64,410	23	34,440	38,870
12	58,820	62,110	24	32,790	37,175
13	56,240	59,890	25	31,220	35,560
14	53,860	57,470	26	29,740	34,010
15	51,200	55,170	27	28,340	32,550
16	48,780	52,910	28	27,030	31,150

Table XLIII. gives the ultimate strength of cylindrical and square cast-iron columns, as judged by the ratio of length to least diameter. A suitable factor of safety must, of course, be applied in every calculation, and attention must be paid to the form and condition of the ends.

Ex. 1.—Find the safe load of a cast-iron column with fixed ends, length 15 ft., diameter 10 in., thickness of metal 1 in., factor of safety =8.

Here, $\frac{l}{d} = \frac{180}{10} = 18$, the equivalent strength for which in the table is 44,200 lbs. per square inch. The area of the column is $\cdot 7854\ (10^2 - 8^2) = 28\cdot 27$. Therefore the total safe load is

$$\frac{44{,}200 \times 28\cdot 27}{8} = 156{,}191 \text{ lbs., or } 69.7 \text{ tons.}$$

Table XLIV. — Calculated Safe Loads for Wrought-Iron Struts & Columns (Birkmere) in pounds per square inch of sectional area.

For round columns add 10 per cent. to the figures given below; for square columns add 5 per cent.

Length ÷ Least Radius of Gyration.	Flat Ends.	Fixed Ends.	Hinged Ends.	Round Ends.
20	14,380	14,380	13,940	13,330
30	13,030	13,030	12,460	11,670
40	11,760	11,760	11,110	10,140
50	10,860	10,860	10,130	8,930
60	10,000	10,000	9,230	7,820
70	9,190	9,190	8,330	6,850
80	8,420	8,420	7,500	5,950
90	7,920	7,950	6,840	5,230
100	7,450	7,500	6,220	4,560
110	6,840	7,070	5,620	3,980
120	6,260	6,670	5,060	3,440
130	5,790	6,220	4,580	2,960
140	5,340	5,800	4,120	2,510
150	4,830	5,390	3,570	2,120
160	4,350	5,000	3,060	1,760
170	3,920	4,570	2,640	1,530
180	3,500	4,170	2,250	1,310
190	3,190	3,830	2,020	1,150
200	2,900	3,500	1,800	1,000

Table XLIV. gives safe loads for wrought-iron struts and columns as calculated by Mr. Birkmere, of New York. Before this Table can be used for any given column, the radius of gyration must be ascertained, either by calculation or from one of the numerous tables always available in the United States, but rarely so in this country. Suppose we wish to find the safe load for an I-joist used as a column, with flat ends; length 10 ft., size 10 in. by 5 in., area 8·53 in. The value of r is found by calculation to be 1·14, therefore $\frac{l}{r} = 120 \div 1\cdot 14 = 105$, and if we take the strength opposite to the ratio 110 in the table, the safe load per square inch is 6,840 lbs. Multiplying this by the area, we have $6{,}840 \times 8\cdot 53 = 58{,}345$ lbs., or 26 tons total safe load. Similar calculations can readily be made for any other form of section.

Table XLV. gives particulars of the well-known Phœnix columns, and is an example of the information furnished in respect of American manufactures. It will be observed that the fullest details are given on all essential points, so that strength can easily be estimated by the usual rules, or by any reliable table showing either the ultimate strength, or the safe load corresponding to an ascertained value of the ratio $\frac{l}{r}$.

Table XLV.—Dimensions of Phœnix Columns.

Columns A, B^1, B^2, and C have four Segments. Least Radius of Gyration = D × ·3636.

One Segment.		Diameters in inches.			One Column.			Size of Rivets.
Thickness in inches.	Weight in lbs. per yard.	d Inside.	D Outside.	D^1 Over Flanges.	Area of Cross Section square in.	Weight per foot in lbs.	Least Radius of Gyration in inches.	
⅜	9⅜	A 3⅜	4	6⅞	3·8	12·6	1·45	⅞×1½
½	12		4⅛	6⅞	4·8	16·0	1·50	1
⅝	14½		4¼	6⅞	5·8	19·3	1·55	1
¾	17		4⅜	6⅞	6·8	22·6	1·59	1½
½	16	B 4⅛	5⅛	8⅛	6·4	21·3	1·92	⅞×1½
⅝	19½		5⅛	8¼	7·8	26·0	1·96	1½
¾	23		5⅛	8¼	9·2	30·6	2·02	1½
⅞	26½		5⅛	8⅜	10·6	35·3	2·07	1½
1	30		5⅛	8⅜	12·0	40·0	2·11	1½
1⅛	33½		5⅛	8½	13·4	44·6	2·16	2
1¼	37		6⅛	8½	14·8	49·3	2·20	2½
½	18½	C 5⅛	6⅞	9⅛	7·4	24·6	2·34	⅞×1½
⅝	22⅞		6⅞	9⅛	9·0	30·0	2·39	1½
¾	26⅞		6⅛	9⅛	10·6	35·3	2·43	1½
⅞	30⅞		6⅛	9⅛	12·2	40·6	2·48	1½
1	34⅞		6⅛	9⅛	13·8	46·0	2·52	1½
1⅛	38⅞		7⅛	9⅛	15·4	51·3	2·57	2
1¼	42⅞		7⅛	9⅛	17·0	56·6	2·61	2½

Table XLVI. is one of a series contained in the handbook of Messrs. Carnegie, Phipps, & Co., and once more the superiority of American commercial methods becomes strikingly evident.

Table XLVI.—Safe Loads in tons of 2,000 lbs. of Steel Z-bar Columns, square ends (Carnegie, Phipps, & Co.).

Allowed strains per square inch for steel, safety factor 4:—

12,000 lbs. for lengths of 90 radii or under. $17{,}100 - 57\frac{l}{r}$ for lengths over 90 radii.

20 in. Steel Z-bar Columns.

Section: 4 Z-bars 6½ in. × ⅞ in. 1 Web Plate 14 in. × 1 in. 6 Side Plates 20 in. wide.

Length of Column in feet.	20 × ⅜ plates = 453·0 lbs. = 134·7 square in. r (min.) = 5·92.	20 × 7/16 plates = 466·5 lbs. = 137·2 square in. r (min.) = 5·92.	20 × ½ plates = 479·0 lbs. = 139·7 square in. r (min.) = 5·92.	20 × 9/16 plates = 483·5 lbs. = 142·2 square in. r (min.) = 5·92.	20 × ⅝ plates = 492·0 lbs. = 144·7 square in. r (min.) = 5·91.	20 × 11/16 plates = 500·5 lbs. = 147·2 square in. r (min.) = 5·91.	2[illegible] × ¾ plates = 509·0 lbs. = 149·7 square in. r (min.) = 5·91.	20 × 13/16 plates = 517·5 lbs. = 152·2 square in. r (min.) = 5·91.	20 × ⅞ plates = 526·0 lbs. = 154·7 square in. r (min.) = 5·90.
44 and under	808·1	823·1	838·1	853·1	868·1	883·1	898·1	913·1	928·1
46	793·7	808·3	823·0	837·5	852·1	866·7	881·2	895·8	910·4
48	778·2	792·5	806·9	821·2	835·5	849·7	864·0	878·3	892·6
50	762·6	776·7	790·8	804·7	818·7	832·8	846·7	860·7	874·7

So far as the use of tables is concerned, it may be said that absolute reliance should never be placed upon such aids to calculation, and the architect should always know exactly what is the true purport of all data that he is employing. Tables of dimensions, whether concrete or abstract, are usually reliable when issued by responsible firms, but information as to the ultimate strength, and especially as to the safe loads of columns, ought to be accepted with some reserve, unless their origin and the conditions to which they apply are fully known. It is preferable to adopt tables showing ultimate strength, as the operator can then add his own factor of safety according with the nature of the case under consideration. Even then great care must be taken in the selection of tables, for many of the tests by different experimenters do not in themselves afford any reliable basis for practical work. It is only when records furnished by experiments covering a sufficiently wide range are gathered together in large numbers and submitted to close scrutiny and classification, that their real teaching becomes evident. More harm than good is likely to result from the indiscriminate repetition of data in various text-books and collections of tables; and no really comprehensive and intelligible summary of all authoritative records has hitherto existed. This deficiency has to some extent been made good by recent investigations, to which attention will be directed in our next chapter.

BOOKS RECEIVED.

IRON CORROSION; ANTI-FOULING AND ANTI-CORROSIVE PAINTS. By L. E. Andés. Translated from the German by Charles Salter. (Scott, Greenwood, & Co.)

FIRE-TESTS WITH PARTITIONS. (Nos. 44 and 47 of the British Fire Prevention Committee's publications.)

PROCEEDINGS OF THE ASSOCIATION OF MUNICIPAL AND SANITARY ENGINEERS. Volume XXV. 1898-99. Edited by Thomas Cole. (E. & F. N. Spon.)

OBITUARY.

M. LÉON FALGUIÈRE.—We greatly regret to have to record the death of this eminent French sculptor, which took place a few days ago from the unfortunate results of an operation which he had undergone in the hope of curing an internal malady from which he was suffering. Falguière was born at Toulouse in 1832, and, while still very young, came to Paris as a pupil of Jouffroy, and at first worked in the style of rather weak elegance which he imbibed from his master, and which was in fashion from forty to fifty years ago. Later, when he had gained success, he created a more robust style of his own, marked by an unmistakable æsthetic individuality. He obtained the Prix de Rome in 1859, and subsequently sent from Italy his "Vainqueur au Combat de Coq," which attracted great attention in the Salon of 1864, and procured him a medal at the great exhibition of 1867. His "Thesée Enfant," exhibited the year after, was also much admired. Since then he has produced a great number of works, among which the following may be mentioned: "Martyr Chrétien," a marble statue which obtained a medal of honour; the statue of Corneille near the Théâtre Français; the "Danseuse Egyptienne," which was a great success in the Salon of 1873; the "Suisse accueillant l'Armée Française," exhibited in 1876; a statue of Lamartine which gave rise to much discussion; a "Diana" in marble which was one of his finest works; "À la Porte de l'Ecole," a plaster group; the Lafayette statue, now at Washington; the "Femme au Paon," another remarkably fine ideal nude, a worthy successor to the Diana. He was also the author of the "St. Vincent de Paul" in the Panthéon; of the "Pêche," a marble statue forming one of the decorations of the Paris Hôtel de Ville, and the plaster model of which is in the Municipal Pavilion of the great exhibition; of the allegorical figure of "Asia" at the cascade of the Trocadéro; and of a monument to Gambetta erected at Cahors. Among his latest works was the statue of Cardinal Lavigerie in the 1898 Salon—a work which, unavoidably perhaps, was somewhat unsculpturesque in character. He had also executed, some twenty years ago, a colossal quadriga symbolising the car of the Republic, a plaster model of which was placed, from 1881 to 1886, on the Arc de l'Etoile, but was finally demolished. The committee of "Les Gens de Lettres" had commissioned him to model the statue of Balzac, in place of the one by M. Rodin which they had refused; the plaster model was exhibited in the 1899 Salon, and the bust he had just completed before his death. He leaves unfinished the model for the monument to Pasteur. His last completed work was the statue of Daudet recently inaugurated at Nimes. Falguière was created "Chevalier" of the Legion of Honour in 1870, "Officier," in 1878, in connexion with the great exhibition of that year, and "Commandeur" on the occasion of the 1889 exhibition. Since 1882 he was Professor at the Ecole des Beaux-Arts, and was also, in the same year, elected a member of the Institute as successor to his master Jouffroy. It should also be mentioned that he had tried painting with some success, and the female figure in his "Femme au Paon" had previously appeared on the walls of the Salon as a picture, under the title "Juno."

The following works by Falguière have been illustrated in the *Builder*: "La Musique" (June 1, 1889); "La Poésie Héroique" (July 22, 1893); "Le Poéte" (September 11, 1897); Model of the Statue of Balzac (June 10, 1899).

MR. B. E. FERREY.—We learn with regret of the death, in his fifty-fifth year, at his residence, No. 50, Abingdon-villas, W., of Mr. Benjamin Edmund Ferrey, F.S.A., of No. 110, St. Martin's-lane, W.C. Mr. Ferrey was the only son of the late Benjamin Ferrey, F.S.A., and was elected Associate of the Royal Institute of British Architects in 1868 (having won the Silver Medal in that year) and Fellow in 1877. As joint architect with his father he carried out the enlargement and alterations of St. Lawrence Church, New Brentford (illustrated in the *Builder* of May 1, 1875.) He was architect of St. Mary Magdalene Church, Trinity-road, Upper Tooting, of which the nave and aisles were consecrated in December, 1888—one of the aisle panels, "The Ascension," the first of a series in terra cotta, being designed by Mr. Tinworth, and executed at Doulton's works, Lambeth. His designs for the church were subsequently completed by the erection of the chancel in 1899. Mr Ferrey was also the architect of an enlargement, in 1896, of Christ Church, Victoria-road, Kensington, as originally designed by his father, and consecrated on July 23, 1851, and of the church at Fauls, in Shropshire, to which he added, in 1898, the organ chamber built in memory of the late Rowland Clegg, third Viscount Hill, of Hawkstone Park, Shrewsbury, who died on March 30, 1895.

MR. R. RANDALL, F.S.I.—The death occurred on the 20th inst. of Mr. R. Randall, F.S.I., late surveyor, War Department, at his residence, 1, Sunbury-gardens, Palmerston Park, Dublin. The deceased was sixty-six years of age, and retired only a year ago, so did not long enjoy his pension. During his lengthy career he was stationed at the War Office, Birmingham, Aldershot, Colchester, Halifax, and for the last thirteen years of his service at the Curragh. Here he was responsible for the construction and finance of the great barrack scheme which is now in progress at that place, and he was

an energetic and incessant worker. He was also architect of the Church of Ireland Soldiers' Institute, Roman Catholic Soldiers' Institute, and Nurses' Home, at the Curragh.

GENERAL BUILDING NEWS.

WESLEYAN CHURCH, DARLINGTON.—The foundation stone has just been laid of a new Wesleyan Church at East-road. Mr. James W. Thompson, of Newcastle, is the architect. The new church, which includes three vestries, is designed in the Gothic style, and will measure in the inside 78 ft. 9 in. by 41 ft. 8 in. The main elevation will be of red pressed bricks and stone dressings. The seating will be of pitch pine, the windows, doors, and screens will all be glazed with cathedral tinted glass with leaded lights.

PROPOSED CHANCEL, BUCKLEY CHURCH, FLINTSHIRE.— Plans have been prepared by Messrs. Douglas & Fordham, architects, of Chester, for a new chancel at Buckley Church, to cost about 1,000*l.*

CHURCH, OLDCOTES, NOTTINGHAMSHIRE. — The Bishop of Derby visited Oldcotes recently for the purpose of opening the new chapel of ease to the parish church of All Saints', Harworth. The building, which is dedicated to St. Mark, has been erected to the designs of Messrs. Hodgson & Fowler, of Durham. The church is on brick foundations, the superstructure being of wood and cement, the timbers being pitch pine, Stockholm tarred. The building comprises nave, chancel, vestry, and porch, with bell turret at the west end, and is roofed with red tiles. The floor is of wood; the seating is for about a hundred persons. The contract has been carried out by Messrs. Kelsey, of Goole.

PRIMITIVE METHODIST CHAPEL, MATTISHALL, NORFOLK.—Foundation stones of a new Primitive Methodist chapel at Mattishall were laid on the 16th inst. Mr. King, of Mattishall, is the builder, and Mr. Kerridge (Messrs. Kerridge & Son, of Wisbech) is the architect.

CONGREGATIONAL CHURCH, ILFORD. — The memorial stones of a new Congregational church, in High-street, Ilford, were laid recently. The architect is Mr. J. D. Mould.

BOARD SCHOOL, CHESTERFIELD.—On the 18th inst. the foundation stones of a new Board school were laid at Chesterfield. The school is being erected at the corner of Ashgate and Foljambe roads, and is to be called the Central Board School. A site of six acres here was secured by the Board for 5,000*l.*, and a considerable portion will be available for other purposes. The school itself will cost 14,230*l.*, exclusive of site and furniture, and accommodation will be provided for 1,191 children. The building will have red brick facings and terra-cotta dressings, and the frontage will be to Ashgate-road. Under the central hall will be swimming baths, cookery, and laundry rooms, and a pupil teachers' centre. The architects are Messrs. Tiltman & Jackson, and the contractors Messrs. J. C. Kellett & Son, Leicester.

WESLEYAN BUILDINGS, NORTHAMPTON. — The memorial stones have just been laid at Northampton of Wesleyan School Buildings, including a large assembly hall. The site of the new buildings is at the junction of the Wellingborough-road with Stimpson-avenue. Plans for the assembly hall and school buildings, and also for the church, which is subsequently to be erected, have been prepared by Mr. H. H. Dyer, architect, Northampton. Mr. Edward Green is building the schools and assembly hall at a cost of just over 2,000*l.* The assembly hall will seat an audience of 450, and the school buildings comprise an infants'-room, capable of accommodating 150, and eight class-rooms, two of which can be thrown into the assembly hall, while there is a parlour for the ladies in connexion with the church.

DIAMOND JUBILEE HOSPITAL, COLNE, LANCASHIRE.—A cottage hospital has just been erected at Colne at the expense of Mr. W. P. Hartley. The townsfolk decided to commemorate the Queen's Diamond Jubilee by the erection of a cottage hospital for the reception of accidents and other cases. The institution will provide accommodation for fourteen patients, with space for extension, and is arranged as a central block of two stories, with two wings of one story, and a kitchen block in the rear. The building is Tudor in style, and the architect was Councillor Holgate.

MASONIC HALL, LIMAVADY, IRELAND. — The foundation stone of a new hall for the Freemasons of Limavady was laid on the 10th inst. The building will be of red brick, with red sandstone facings, with a roof of red tiles. The architect is Mr. W. J Given, of Coleraine, and the builder is Mr. James Wray, of Limavady.

CONSERVATORY, STANLEY PARK, LIVERPOOL.—The new "Gladstone" Conservatory, which has been erected near the Anfield-road entrance to Stanley Park, Liverpool, was opened on the 23rd inst. The structure, of iron and glass, is 120 ft. long, 50 ft. wide, 10 ft. high at the eaves, and 30 ft. at the ridge. It was designed by Mr. Baillie Mackenzie, of Edinburgh.

UNION OFFICES, NEWPORT, MON. — The new offices for the Newport Board of Guardians, at Queen's-hill, Newport, were opened on the 21st inst. The building is of red Mansfield stone with pressed brick facings and Bath stone dressings. Mr. Benjamin Lawrence, of Newport, was the architect, and Mr. A. S. Morgan was the builder.

PROPOSED ENLARGEMENT, MELTON ASYLUM, SUFFOLK. — Colonel C. H. Luard, R.E., Local Government Board Inspector, held an inquiry at the Town Hall, Ipswich, on the 19th inst., respecting the application of the Suffolk Joint Committee for permission to borrow 58,500*l.* for purposes of the Suffolk County Lunatic Asylum at Melton. The proposed works comprise additional blocks for 280 patients, new boiler house, steward's stores, bakery, mess and recreation rooms for attendants, an isolation hospital, medical superintendent's house, farm buildings, mortuary, staff cottages, lodges, and the installation of electric light both in the new and existing buildings. The scheme was explained in detail by the architect, Mr. A. J. Wood, Surrey-street, Strand.

SANITARY AND ENGINEERING NEWS.

SEWAGE SCHEME, BIRSTALL, LEICESTER.—Col. W. Langton Coke held an inquiry at Birstall, on the 18th inst., on behalf of the Local Government Board, into an application by the Barrow-on-Soar Rural District Council for a provisional order to empower the Council to put in force for the purposes of sewerage and sewage disposal for the township of Birstall, the powers of the Land Clauses Acts with respect to the purchase and taking of lands otherwise than by agreement, and for sanction to borrow 5,500*l.* to carry out the scheme. Mr. Deane, solicitor for the Council, said the scheme now submitted was a gravitation scheme only. There were certain arrangements for pumping in the original, which were not in the amended, scheme. Mr. W. H. Simpson submitted the plans of the amended scheme.

DRAINAGE SCHEME, EASTLEIGH AND BISHOPSTOKE, HANTS.—Col. J. T. Marsh, R.E., held an inquiry on the 19th inst. into an application by the Eastleigh and Bishopstoke Urban District Council for permission to borrow 16,000*l.* for the purpose of sewerage and sewage-disposal for Bishopstoke and a small portion of Eastleigh. The inquiry was held at the Urban Council's offices. A detailed report on the scheme was presented by Mr. John Henry Blizard, of Messrs. Blizard & Lemon, engineers.

SEWERAGE SCHEME, TRURO.—Mr. F. H. Tulloch, an Inspector to the Local Government Board, held an inquiry at Truro on the 19th inst. into an application by the Corporation for sanction to borrow 7,500*l.* for works of sewerage. The system proposed to be adopted in the treatment of the sewage was explained by Mr. F. Candy, general manager of the International Purification Syndicate. The plans were explained by Mr. G. M. Taylor, of Messrs. Taylor, Sons, & Santo Crimp.

FOREIGN.

FRANCE.—M. Guilbert has received the medal of honour for architectural exhibits at the Salon, for his remarkable exhibit of the model and drawings of the memorial chapel, fully described in our recent article on "Architectural Drawings at the Salon." ——The medal of honour for painting has been awarded to M. Humbert, and for sculpture to M. Verlet, author of a monumental fountain intended for Bordeaux.——The President of the Republic is to officially inaugurate the two Fine Art palaces, at the Exhibition, on May 1.——The central group of sculpture from the old Palais de l'Industrie has been set up in the park of St. Cloud.——M. Saint-Marceaux, the sculptor, has just completed his model for the monument to Daudet to be erected at Paris. It represents the eminent novelist seated by an olive tree on which he rests his hands, in an attitude of meditation.——An International Congress of Theatre Art is to be held in Paris from July 27 to July 31. Theatre architecture, its internal and external treatment, will be one of the subjects most prominently considered; also the questions of the safety of the audience, the lighting of the stage and the auditorium, machinery, decoration &c. The architectural section will be presided over by M. Bunel, architect-in-chief to the Prefecture of Police.——Mr. McKim, the well-known American architect, has been commissioned to design a pedestal for the statue of Washington by Mr. French, to be presented by American ladies to the city of Paris. The pedestal and statue will be erected on the Carrefour d'Iena. ——The Municipality of Paris are proposing to cover in completely the river Bièvre for the length of its passage through Paris.——The new museum at Nantes has just been opened.——M. Aubé, the sculptor, has just completed a splendid centrepiece for a table, in silver and crystal, for the Palais de l'Elysée. It represents a ship, in silver, on a sea of rock crystal. The ship is the "Ship of Peace," with France at the helm (!) accompanied by Russia, while four personages representing Art, Commerce, Science, and Industry, act as rowers. The centre is surrounded by groups representing Europe, Asia, Africa and America. The whole has been cast by the *cire perdue* process.——We have to record the death of two French sculptors—M. Charles Rochet, who completed the statue of Charlemagne on the Place du Parvis Nôtre Dame (commenced by his brother Louis Rochet), and who was eighty-five years of age; and M. Louis Pierre, a sculptor who has received medals at various Salons, and who was the author of the statue of "Le Botteleur" in the park of Montsouris.

AUSTRALASIA. — A large wire-rope bridge has recently been constructed across Chasm Creek, in connexion with the Westport-Cardiff Colliery, Middle Island, New Zealand. It is 200 ft. in length, is of the inverted bow-string type, supported by four steel-wire cables. The travelling load is ten tons, and the haulage is conducted on the endless rope principle.

UNITED STATES.—The plans for the new library building in Washington, which have been prepared by Messrs. Ackermann & Ross, architects, of New York, are about to be revised. The endowment for the building is $350,000, and, now that the quantities have been gone into, it has been found necessary to so revise the plans as to effect a reduction in cost of as much as 40 per cent. of the whole.——A model of the proposed Chicago Post-office building has recently been made by M. Garet, a Frenchman resident in Washington, and has been placed on exhibition in the Treasury Department. ——A 36-in. water main has recently been constructed across Harlem River, New York. At the point crossed the Harlem river is 1,200 ft. in width, and in laying the main it was found necessary to dredge a trench across the river to a depth of 30 ft. below mean low water. The flexible joint pipe used was 36 in. inside diameter; it was laid in 12 ft. lengths, with a bell and spigot joint at the two ends. The joint is a modification of the Ward flexible joint.——Some remarkable ruins of a large house built by the Pueblo Indians have recently been discovered in San Juan County. The building was seven stories in height, and is built with stone roughly dressed and laid in clay mortar. The timbering of the floors is of heavy logs of red spruce, covered with smaller ones laid at right angles to them, the whole being covered with small wood and bark finished with a layer of clay.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS. —Sir Thomas N. Deane & Son, architects, have removed their offices from 3, Upper Merrion-street, to 15, Ely-place, Dublin.——Messrs. Roberts Adlard & Co., slate merchants, have removed their City offices to 98, Great Tower-street, E.C. Communications to be addressed to their head offices, 26, Bermondsey Wall, S.E.

THE BRITISH FIRE PREVENTION COMMITTEE.— On Wednesday, May 2, the official tests, under the auspices of the British Fire Prevention Committee, will comprise partition tests between match-boarded partitions of "non-flammable" wood and ordinary wood. Other tests in May will include investigations with a "Mack" partition by Messrs. King & Co., and with another partition by the Fireproof Partition Syndicate, as well as several tests with doors and fire-blinds; whilst a number of private experiments will also be undertaken during that month. Reports have been issued during the current week on a match-boarded partition filled in with slag wool by Messrs. Anderson & Son and Messrs. Broadbent & Co.; and on a partition by the Mural and Decorations Syndicate, Limited. Further reports will be issued in May on a floor of wood joists with concrete filling and a match-boarded ceiling; and on one of wood joists with concrete filling and plaster ceiling on expanded metal lathing. Reports will also be issued in May on a test with a floor by the Mural and Decorations Syndicate, Limited, some fire screens by Mr. R. Bugge, and a number of doors constructed in three thicknesses of deal, oak, and teak. Regarding the question of obtaining some International basis for tests with fire-resisting materials with a view of arriving at comparative results, there are still considerable difficulties in the way. Mr. Edwin O. Sachs, the Chairman of the Committee, who has been inspecting, by invitation, the new Government fire-testing grounds at Berlin, finds that the proposed assimilation of the testing arrangements is the more difficult as the plant and methods of the Committee are so far in advance of anything to be found on the Continent, where this form of research work is still carried on in a very incomplete and primitive manner. It is, however, hoped that in some of the technical details—such as the measurements, recording temperatures, &c.—the metric system and the centigrade system can be shortly adopted by the Committee, together with the usual figuring in feet and Fahrenheit.

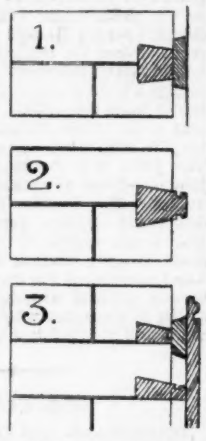
FREEMASONRY APPOINTMENT.—The Prince of Wales, as Grand Master of English Freemasons, has appointed Mr. H. L. Florence to the office of Grand Superintendent of Works for the ensuing year, being the third year in succession that this office has been conferred upon him.

SOCIETY OF ARTS.—In consequence of the illness of the author, the following paper announced for reading before the Society of Arts is unavoidably postponed:—April 24 (Applied Art Section).—E. F. Strange, "The Practice of Lettering."

CHURCH BUILDING SOCIETY.—The Incorporated Society for Promoting the Enlargement, Building, and Repairing of Churches and Chapels held its usual monthly meeting on the 19th inst. at the Society's

House, Dean's-yard, Westminster, the Rev. Canon C. F. Norman in the chair. Grants of money were made in aid of the following objects, viz.: building new churches at Leyton, Christ Church, Essex, 100*l.*; Bordesley, St. Oswald, near Birmingham, 100*l.* in lieu of a former grant of 80*l.*; and Denaby Main, near Rotherham, 55*l.* in lieu of a former grant of 35*l.*; and towards enlarging or otherwise improving the accommodation in the churches at All Cannings, All Saints, near Devizes, 25*l.*; Little Bowden, St. Nicholas, near Market Harborough, 35*l.*; Noman's Heath, St. Mary-the-Virgin, near Tamworth, 10*l.*; and Radley St. James, near Abingdon, Berks, 20*l.* A grant of 60*l.* was paid for works completed towards All Saints, Gwynfe, near Llangadock, Carmarthen. In addition to this the sum of 282*l.* was paid towards the repairs of thirty churches. The Society likewise accepted the trust of sums of money as repair funds for Great Crosby, St. Faith, Lancs, and Walkden Moor, St. Paul, Lancs. The annual general court of this Society will be held on Thursday, May 17, at the Church House, Dean's-yard, Westminster, at 3 p.m., when the chair will be taken by the Bishop of London.

FIXING WOODWORK TO WALLS. — Mr. Percy Chick, builder's foreman, Putney, sends us the specification of a patent he has taken out for the better fixing of woodwork to walls, by means of dovetailed recessed bricks taking a dovetailed wood slip or plug, as shown in the diagram, either flush with the wall or projecting from it, as desired. It is a more workmanlike process than cutting into brickwork after it is built to insert wood plugs. The practical difficulty perhaps would be to create a sufficient demand to induce brickmakers to make the bricks. Brickmakers are generally very unwilling to go out of the beaten track of their manufacture.



SCOTTISH BUILDING TRADES FEDERATION.—The half-yearly meeting of this body was held on the 19th inst. in the Palace Hotel, Aberdeen, Mr. A. Beveridge, builder, Perth, one of the vice-presidents, occupying the chair. It was resolved to appoint a consultative committee of 24 members—six from each of the four largest Scotch towns, viz., Glasgow, Edinburgh, Dundee, and Aberdeen—each of the six to represent a different trade; the committee to meet from time to time, chiefly with regard to wages and conditions of labour. Recent trade disputes were referred to, and it was reported that there was a prospect of a satisfactory arrangement being come to with the architects in the different towns as to general conditions of contract.

PUBLIC IMPROVEMENTS, PEMBROKE.—Mr. P. C. Cowan, Chief Engineering Inspector to the Local Government Board, held an inquiry on the 17th inst. in the Town Hall, Ballsbridge, into the question of loans for which the sanction of the Local Government Board was asked by the Pembroke Urban District Council. The loans amount in all to 23,632*l.*, and the purposes for which they are required are as follows:—Constructing street crossings, paving pathways, erecting working-class lodging-houses under the Housing of the Working Classes Acts, improvement of Fire Brigade Station, and alterations and additions to the Town Hall. Mr. Jefferson, who appeared for the Council, said the amount they were applying for in connexion with the Town Hall and Fire Brigade Station was 3,000*l.* Mr. J. H. Middleton, engineer, gave evidence of the proposed scheme for the granolithic pavement of the pathways. Mr. J. J. Farrell, architect, who had made an estimate for the Urban Council in connexion with the erection of forty labourers' cottages in Donnybrook, said twelve of these cottages would be four-roomed houses and the remaining twenty-eight three-roomed houses. Mr. Charles H. Ashworth, architect, gave particulars of the improvements and alterations at the Town Hall and Fire Station.

BUILDING IN LLOYD'S-AVENUE.—The remaining space in the new thoroughfare between Fenchurch-street and Crutched-friars, is already appropriated for the erection of suites of offices by Messrs. Braid, Pater, & Co., contractors, after Mr. Herbert E. Knight's plans and designs, on the east side, and, on the west side, of suites of offices to be designed by Mr. W. Hilton Nash.

ST. MICHAEL CHURCH, BASSISHAW. — In the Guildhall Museum has just been deposited the large piece of carving, painted for the most part in white, of the Royal Arms with the Arms of the City at each side, which was in the Church of St. Michael, Bassishaw, recently demolished. It was set up, above the organ, against the west wall of the church, immediately beneath the ceiling, and extended across nearly the entire width of the nave. A portion of the altar-piece has been removed, under the care of Mr. George H. Birch, to St. Mary's, Basing. The Church of St. Michael was erected at a cost of 2,823*l.*, after Wren's designs, in 1675-9. The open space at the east end was formerly the churchyard, levelled in 1865, and the site of the parish engine and watch houses (1681-1840).

PUBLIC IMPROVEMENTS, ROTHERHAM. — Mr. H. Percy Boulnois, Inspector to the Local Government Board, recently held an inquiry in the Council Chamber, Rotherham, relative to applications by the Corporation to borrow 50,000*l.* for the purposes of sewerage and sewage disposal, 6,000*l.* for purposes of municipal buildings, and 4,000*l.* for alterations and additions to the Mechanics' Hall. Mr. R. E. W. Berrington, engineer, stated that the sewers and works comprised in the proposed loan were for the Heringthorpe district, the Templeborough district, and the Richmond Park district. The 6,000*l.* for the municipal buildings was for extensions to the Council Chamber and the provision of offices for the Town Clerk and other Corporation officials. The architect for this work is Mr. J. Lovell. The loan for the Mechanics' Hall was to enable the Corporation to make various alterations and additions to the hall. The architect is Mr. J. Platts.

STREET IMPROVEMENT, CLEETHORPES.—Major-General H. D. Crozier, R.E., Inspector to the Local Government Board, held an inquiry at Cleethorpes on the 19th inst. into an application by the Urban District Council for power to borrow 1,480*l.* for purposes of street improvement at the Market Place. Mr. E. Rushton, Surveyor to the Council, produced plans, and gave details of the scheme.

CAPITAL AND LABOUR.

ABERDEEN JOINERS' STRIKE —At a mass meeting on Saturday last of the Aberdeen joiners on strike a proposal of the masters to compromise the dispute by paying 8¼d. per hour was considered, and after full discussion it was unanimously agreed to remit the matter to arbitration.

THE BRADFORD BUILDING TRADE. — The threatened trouble between the carpenters and joiners in Bradford and their employers has been avoided by the men accepting an increase of 1d. per hour, making the rate 9d. The stonemasons, however, have not as yet been satisfied. The men want 10d. per hour, and the masters decline to offer more than 9½d. Accordingly, a strike is expected in May.

THE ARBROATH JOINERS.—The Arbroath joiners are still on strike against the reduction by the masters of the rate of pay from 8d. to 7½d. per hour. A new element of dispute has entered into the question in respect of the employment of non-union men by some of the masters who had conceded the higher rate of wages. The men have intimated that they will not work alongside non-union men, and it is likely, it is stated, that this difficulty will be settled in accordance with the desire of the union men.

OPERATIVE MASONS' WAGES, GLASGOW.—A mass meeting of the operative masons of Glasgow was held on the 20th inst. in the Albion Halls for the purpose of considering the proposed reduction of wages. The men are working under a yearly agreement which expires at the end of June. The masters desire to reduce the wages from 9½d. per hour to 9d., and in accordance with the terms of the agreement they communicated some time ago with the representatives of the men, asking that this should be given effect to. The men's officials met them in conference on the 9th inst, and as a result of this conference the matter was laid before the meeting on the 20th inst. At the close of the meeting it was officially intimated that by an overwhelming majority the men decided to adhere to the standard wage of 9½d. per hour.

THE BUILDING TRADE, STAFFORDSHIRE.—The building trade in North Staffordshire is moderately good, but considerable anxiety is manifest by both employers and operatives as to the steps the bricklayers will take on the demand they have made for an advance of wages, inasmuch as up to the time of writing they had refused to accept arbitration by the Board of Trade, which the employers have offered to them. On the other hand, the joiners have agreed to abide by the decision of the Board of Trade arbitration. The condition of employment is good in all departments, particularly joiners, who are very well employed. Bricklayers have a few out of work. Painters and plumbers are exceptionally busy, and overtime is general. Plasterers, stonemasons, bricklayers, labourers, and all the operatives in the brick and tile yards, are fully employed.—*Staffordshire Sentinel.*

DISPUTE IN THE POTTERIES BUILDING TRADE. —Sir John Taylor, K.C.B., sat as arbitrator at the North Stafford Hotel, Stoke-on-Trent, on the 24th inst., in regard to a dispute between the carpenters and joiners and the master builders of the Potteries and Newcastle-under-Lyme about wages. The operatives had given notice for a reduction of hours and an increase of wages from 8½d. to 9d. per hour, and the employers had given a counter-notice for a reduction of one hour per week and a reduction of wages from 8½d. to 8d. per hour. The notices do not take effect until May 1. The matter in dispute was considered at great length. It is expected that the arbitrator's award will be made before the notices expire.

AIRDRIE AND COATBRIDGE JOINERS.—On the 24th inst. a meeting of representatives of the masters and of workmen was held in Airdrie at which the terms of a settlement of the strke, now in its eighth week, were discussed. An agreement was arrived at as follows:—That the men resume work at the old rate of 9d. per hour, that three months' notice be given on either side before April 1 for a conference, and that any rise or fall of wages then decided on should take effect on June 1. A twelve month's agreement was signed to this effect. The strikers afterwards held a meeting and accepted the terms.

LEGAL.

POINT UNDER THE LONDON BUILDING ACT, 1894.

THE case of the Queen *v.* Shiel and others came before the Court of Appeal, composed of Lords Justices A. L. Smith, Vaughan Williams, and Romer on the 25th inst. on the Appeal of the London County Council from a decision of a divisional Court of Queen's Bench in proceedings taken before a magistrate under Section 150 of the London Building Act, 1894, by the London County Council against Snewin Brothers & Co. The proceedings were taken in respect of a building which was intended to be used as a fully-licensed public-house, part of which was to be used for living in, and the question proposed to be raised was whether a public-house came within Section 74 of the Act, which requires that when a building exceeding 10 square yards in area is used in part for the purposes of trade or manufacture, and in part as a dwelling-house, the two parts shall be separated by walls and floors constructed of fire-resisting materials, and all passages, staircases, and other means of approach to the part used as a dwelling-house shall be constructed of fire-resisting materials. The magistrate decided against the County Council, and declined to state a case for the opinion of the Court on the ground that the same point was decided in the case of "Carritt *v.* Godson & Son," in which a Divisional Court held that a public-house was not within the section. The case of "Carritt *v.* Godson & Son" was decided under a Criminal Section of the London Building Act, and there was accordingly no right of Appeal from the decision to the Court of appeal. The County Council took the present proceedings in order, if possible, that they might get the decision of the Court of Appeal on the matter, and obtained a rule calling upon the magistrate to show cause why he did not state a case. Snewin Bros. & Co. appeared to show cause against the rule, and the Divisional Court (Mr. Justice Channell and Mr. Justice Bucknill) discharged it. Hence the present appeal of the County Council.

The Lords Justices at the conclusion of the arguments held that the present case was on all fours with the case of "Carritt *v.* Godson & Son," and that the magistrate was perfectly right in refusing to state a case.

The appeal was accordingly dismissed.

Mr. Horace Avory appeared for the London County Council in support of the appeal; and Mr. Danckwerts, Q.C, for Snewin Bros. & Co.

RECENT PATENTS:

ABSTRACTS OF PATENTED INVENTIONS.

26,962.—METHOD FOR CASTING PIPES, COLUMNS, &c.: *G. W. Crompton & F. Chambers.*—For a core bar to be used in casting columns, pipes, cylinders, &c., is devised a split shell or cylinder, which, whilst normally contracted with spring hoops, can be expanded by means of a bar whose wedges engage with wedges upon the shell's inside, and which slides upon inclines within the shell; the core bar is formed by coating the expanded shell with loam, and, after the casting, is collapsed in order that it may be taken out.

26,991.—ROOFS FOR WORKSHOPS AND FOR OTHER BUILDINGS: *E. Sée.*—Deep girders upon widely-spaced columns carry the roofs, the trusses being joined to beams which support the roof gutters lengthwise; in the roof's sloping sides are placed the skylights, the remaining portions of the roof being covered with sheet metal, slates, tiles, &c.; to prevent loss of direct light the ceilings—made of cement, terra-cotta, plaster, wood, pressed cork, and so on—may be slightly inclined, and insulating air spaces beneath the roof are provided by partitions and by glazing the parts between the ceilings.

27,000.—STAGE FLOORS: *E. O. Sachs.*—The inventor makes up a stage floor of sections that rest upon trussed girders or arches, which are attached to vertical sliding columns, and are joined with ropes to winches and to counter-weights. The winches are worked either by hand mechanism or by a motor, when it is desired to lift or to lower the stage's corresponding section.

27,008.—MANUFACTURE OF PORTLAND CEMENT: *C. F. von Forell.*—Limestone, marl, or chalk, with clay, clay-slate, or similar materials, are first wetted and then dried, broken up, and heated to a red heat in a rotary furnace, whence they are passed to another and more slowly rotating furnace wherein they are fused at a higher temperature in the close proximity of a gaseous fuel burner; a discharge chute and a charge hopper are fitted to the two

furnaces respectively, in order that the calcining and burning may constitute separate processes, and that the calcined materials may be ground or otherwise treated before they are burned.

27,064.—WINDOWS: *W. Turnbull.*—To the upper sash stiles are fastened dovetailed beads which slide in grooves in the lower sash stiles, the sashes being swivelled upon vertical pivots after they have been screwed or bolted together in a slightly-open position. Instead of parting beads an outer bead upon one side of the frame and an inner bead upon its other side are so hinged that they may be turned backwards out of the way, a swivelling eye near the pivot and pulleys in the window-head are provided for the upper sash's cord, whilst the lower sash's cord runs over pulleys which turn upon vertical pivots, the frame's inside portions are hinged so that the guide pulleys can be easily reached, and the upper and lower inner beads are hinged also, the lower sash's dovetailed grooves being extended beyond the sash with dovetailed strips of metal.

27,118.—A WATERPROOF COMPOSITION: *F. F. Ingham.*—A waterproof material for the exposed surfaces of viaducts, bridges, flat roofs, footpaths, &c., and for covering, in some instances, macadam or paving, is made of rock asphalt, Stockholm tar, Norwegian tar, Archangel pitch, and bitumen boiled together with a portion of sand or grit; it is to be spread over layers of brattice cloth, or canvas, and covered with an additional coating of its own material.

27,146-7.—DRAWING PENS AND COMPASSES: *E. Hervais.*—The ends of the blade are curved so as to include an angle between them; thus, when the pen is held at various angles, it will draw lines varying in thickness, and there will be no need to turn the adjusting screw. The blades, formed of rounded steel wire, fit into a socket, and are retained by means of a screw which engages recesses cut into the blades, and whose head also bears against them. A screw strap with a nut and a fixed washer draws them towards one another, whilst their ends are cut away so as to be half rounded in cross-section, and are bent in order that their points may be closed together.

27,155.—INSPECTION AND CLEANSING OPENINGS; MANHOLES: *F. Young* (*F. Young & Co.*).—The discharge from a house-drain is taken by a stoneware or metal trap whose two openings are carried up by means of two pipes to the ground level. The openings will serve for the introduction of a rod and a scoop wherewith deposits may be taken out. The top covers of the two pipes are after the kind specified in No. 23,589 of 1896.

27,181.—METHOD OF STOPPING DRAIN AND SIMILAR PIPES: *G. M. Reed and W. H. Knight.*—For stopping the end of a drain-pipe, gulley, sewer, junction, or trap is provided an oval-shaped stopper that is held in position with bars or ridges formed at the sides of the pipe end. When its handle is turned through 90 deg. the stopper's longer diameter passes beneath the projecting ridges upon a socket, for instance, which retain it in place; a tight joint with a ring cast in the socket's lower portion is made with a bitumen packing-ring, which is cast upon the stopper's lower rounded portion.

27,396.—BALL-AND-FLOAT VALVES: *F. Wellard.*—To the top of the float is soldered a flattened covering plate, having lugs which fasten it on to the float lever. The float is cylinder-shaped, and has a rounded base.

27,526.—THERMO-ELECTRICALLY FITTED BRICKS: *F. Matthias.*—The invention relates to bricks, archstones, flagstones, and so on, for walls which are exposed to the sun, for ceilings of workshops heated by gas or other illuminants, and for similar objects. The bricks are fashioned hollow. The bottom of the brick which is exposed to heat is closed in with thermo-electrical elements, drawn into points at their other ends, the points being joined with metal bands, and the terminals being carried diagonally through the bricks and connected with those of the bricks next adjacent.

27,547.—FIREPROOF CEILINGS AND FLOORS: *F. F. Kleine and A. Stapf.*—Concrete is filled in over iron bars which are carried beneath the floor's under side, and are overlapped with other iron bars laid in the floor's upper part and sustained by girders and the walls: the bars have projections and channels for holding the concrete, whilst the lower range of bars extend to the joist or girder in order to carry the concrete and prevent it from peeling from the girders when exposed to heat.

27,571.—CONSTRUCTION OF SCAFFOLDING, &C.: *W. W. Bengough.*—Two poles are fastened together at a right angle with U-shaped metal clips made with spikes for holding the wood, and with flanges into which wood-packing is filled, and the clips are then bolted together; for two poles set diagonal-wise are used half-clips which cross one another. A ledger, or a single pole, is secured to the wall with a bolt that passes through a lug which is threaded upon the bolt of the clip. For fastening two poles together end-wise, a clip made in a double U-shape is devised.

27,628.—METHOD OF PREVENTING THE BURSTING OF PIPES IN FROSTY WEATHER: *N. M. Hopkins.*—The pipe has a swelling, which serves as an expansion chamber; at the bottom of the chamber of a horizontal pipe is a cross-rib, which directs the expanding ice into the chamber, and thereby dissipates the pressure within the pipe; in the case of a vertical straight pipe the rib is arranged so as to turn the ice into a side chamber, and for a vertical bent pipe the chamber is formed in alignment with the pipe's inlet portion.

MEETINGS.

FRIDAY, APRIL 27.

Architectural Association.—Messrs. J. D. Crace and Gerald Moira on "Colour Decoration." 7.30 p.m.

Royal Institution.—The Right Hon. Lord Kelvin on "Nineteenth Century Clouds over the Dynamical Theory of Heat and Light." 9 p.m.

SATURDAY, APRIL 28.

Architectural Association.—Sixth spring visit, to St. Paul's Cathedral. 3 p.m.

Royal Institution.—Professor Stanley Lane-Poole, M.A., on "Egypt in the Middle Ages." I. 3 p.m.

St. Paul's Ecclesiological Society.—Visit to the Church of St. Mary Magdalene, Delamere-terrace, Paddington, at 3.30 p.m.

British Institute of Certified Carpenters.—Visit to Messrs. Farmer & Brindley's, Westminster Bridge-road, at 3.30 p.m.

London and Provincial Builders' Foremen's Association.—Quarterly meeting, at the Memorial Hall, Farringdon-street, E.C. Mr. Morgan will read a paper on the "Formation of an Insurance Fund." 7.30 p.m.

Northern Architectural Association.—Visit to the Castle and Black Gate, Newcastle.

WEDNESDAY, MAY 2.

Royal Archæological Institute of Great Britain and Ireland.—(1) Rev. J. G. Marshall on "Lullington Church, Somerset." (2) Mr. J. R. Mortimer on "Embankment Crosses." 4 p.m.

Society of Arts.—Miss Halsey on "Some Unfamiliar Masterpieces of the Italian School." 8 p.m.

Builders' Foremen and Clerks of Works' Institution.—Ordinary meeting of the members. 8 p.m.

Edinburgh Architectural Association.—Annual Business Meeting and President's Valedictory Address. 8 p.m.

Church Crafts League.—General meeting to be held at the Church House, Westminster, S.W. 5 p.m.

THURSDAY, MAY 3.

Carpenters' Hall, London Wall (*Lectures on Carpentry and Joinery*).—Professor T. Hudson Beare on "Strength of Timber and How to Test It." 7.30 p.m.

Civil and Mechanical Engineers' Society.—Professor R. H. Smith on "Valve Gears and Valve Diagrams." 8 p.m.

Institution of Electrical Engineers.—Meeting at the Institution of Mechanical Engineers, Storey's Gate, S.W. If the discussion on Professor Forbes' paper, read on April 26, is concluded, the following paper will be read:—"The Calculations of Distributing Systems of Electric Traction under British Conditions," by Mr. H. M. Sayers. 8 p.m.

FRIDAY, MAY 4.

Royal Institution.—Professor T. E. Thorpe on "Pottery and Plumbism." 9 p.m.

Glasgow Architectural Craftsmen's Society.—Business meeting. 8 p.m.

SATURDAY, MAY 5.

Royal Institution.—Professor Stanley Lane-Poole, M.A., on "Egypt in the Middle Ages." II. 3 p.m.

Edinburgh Architectural Association.—Visit to Bothwell Castle and Church.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

April 9.—By R. DALTON & SON (at Carlisle).

Beaumont, Cumberland.—A freehold farm, comprising 60 acres	£3,100

April 10.—By FAREBROTHER, ELLIS, & Co. (at Twickenham).

Twickenham, Middlesex.—York-st., &c., 58 plots of building land, f. (in lots)	19,680
Loose, Kent.—Paragon-villas, two freehold houses	275

April 16.—By P. MATTHEWS & MATTHEWS (at Felixstowe).

Felixstowe, Suffolk.—High-rd., &c., 52 plots of building land, f. (in lots)	10,257

April 18.—By EDWIN W. HARRIS.

Beckenham, Kent.—Elmers End-rd., two building plots, f.	105
Anerley.—Marlow-rd., Palace View, f., r. 25*l.*	310
Plaistow.—163 to 183 (odd), New Barn-st., u.t. 70 and 80 yrs., g.r. 39*l.*	1,560

By T. N. TURNER.

Acton.—12 and 14, Birkbeck-av., f., r. 54*l.*	835
Highgate.—1 and 3, Holmesdale-rd., u.t. 81½ yrs., g.r. 12*l.* 12s.	520
Shepherd's Bush.—86 and 88, Gayford-rd., u.t. 77 yrs., g.r. 10*l.*	320

By WINDRUM & CLEAVE.

Poplar.—41 to 55 (odd), Portree-st., u.t. 73 yrs., g.r. 34*l.*	1,875
273, East India Dock-rd., u.t. 22 yrs., g.r. 3*l.*, r. 50*l.*	320
Canning Town.—27 to 35 (odd), Hoy-st., and 6, Emily-st., u.t. 953 yrs., g.r. 18*l.*	585
51 to 57 (odd), Wouldham-st., u.t. 54½ yrs., g.r. 12*l.* 12s.	380
Limehouse.—35, Pigott-st., u.t. 45 yrs., g.r. 4*l.*, e.r. 36*l.*	375

April 19.—By DAVID BURNETT & CO.

Dalston.—102, Graham-rd., u.t. 62 yrs., g.r. 8*l.*, r. 45*l.*	450
Islington.—1 and 2, Adelaide-ter., u.t. 36 yrs., g.r. 12*l.* 12s.	970
Holloway.—6, Stanley-ter., u.t. 58 yrs., g.r. 6*l.* 6s., r. 34*l.*	360
Notting-hill.—124A, High-st., u.t. 15 yrs., g.r. 7*l.*, r. 30*l.*	150

By BURTON, SMITH, & Co.

Camberwell.—57 and 59, Hollington-st., u.t. 66 yrs., g.r. 8*l.*	250
Battersea.—2, 4, and 6, Tritton-st., u.t. 66 yrs., g.r. 13*l.*	400

By NEWBON, EDWARDS, & SHEPHARD.

City-road.—9 to 14, Pickard-st., u.t. 28 yrs., g.r. 50*l.* 10s., r. 234*l.*	£1 770
67, 68, 69, 79, and 80, Moreland-st., u.t. 28 yrs., g.r. 41*l.* 10s., r. 191*l.*	1,470
Finsbury-pk.—38, Lorne-rd., u.t. 78 yrs., g.r. 7*l.*, e.r. 42*l.*	450

By DAVID J. CHATTELL (at Chislehurst).

Chislehurst, Kent.—Green-lane, 15 plots of building land, f.	961

By WYATT & SON (at Chichester).

Chichester, Sussex.—72 to 76, St. Pancras, f.	370
148 and 149, St. Pancras, f.	670
141 to 144, Whyke-rd., f.	415
St. Martin's-st., St. Martin's Hall, and house adjoining, f.	510
New Fishbourne, freehold house and shop	195
Aldingbourne, Sussex.—Five freehold cottages	450

April 20.—By HAMPTON & SONS.

Brentwood, Essex.—Warley Villa and 1 acre, f.	2,400

By G. A. WILKINSON & SON.

Bermondsey.—41, Spa-rd., u.t. 27½ yrs., g.r. 5*l.*, r. 56*l.*	610
43, Spa-rd. and 2, Neckinger, u.t. 27½ yrs., g.r. 7*l.* 5s.	855

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum: yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard.

PRICES CURRENT OF MATERIALS:

WOOD.*

Per Petersburg standard hundred.

	£ s. d.	£ s. d.
White Sea: first yellow deals	18 0 0	23 0 0
Second do.	16 10 0	18 0 0
Third do.	13 10 0	14 10 0
Battens, 40s., 30s., and 15s. less respectively.		
Petersburg: first yellow deals	15 10 0	18 0 0
Second do.	13 0 0	14 0 0
Battens, 30s. and 20s. less respectively.		
Petersburg, white deals	12 10 0	15 0 0
Do. white battens	10 0 0	11 10 0
Riga, white deals	10 10 0	11 10 0
Swedish mixed yellow deals	16 0 0	21 0 0
,, Third do.	14 0 0	17 0 0
,, Fourth do.	13 0 0	14 0 0
,, Fifth do.	12 0 0	13 0 0
Battens, 30s., 20s., and 10s. less respectively.		
Whitewood, 10 to 20 per cent. less.		
Finnish unsorted yellow deals	11 10 0	12 0 0
Battens, 10s. and 5s. less respectively.		
Whitewood, 5 to 10 per cent. less.		
Norwegian second yellow battens	8 0 0	8 5 0
Third do.	7 10 0	8 0 0
Fourth do.	7 5 0	7 10 0
Whitewood, 10s. less.		
Danzig, Crown Deck deals, per 40 ft. 3 in.	0 15 0	1 5 0
Brack	0 12 0	1 0 0
St. Lawrence Pine deals, &c., per P.S.H.:—		
1st, Bright and Dry, regular sizes	21 0 0	28 0 0
,, ,, oddments	14 10 0	22 0 0
2nd ,, regular sizes	16 10 0	19 0 0
,, ,, oddments	11 0 0	15 10 0
3rd ,, regular sizes	10 10 0	11 10 0
,, ,, oddments	9 0 0	10 0 0
4th ,, regular sizes	9 10 0	10 10 0
,, ,, oddments	8 10 0	9 10 0
St. Lawrence Spruce deals, &c.		
First, regular sizes	11 0 0	13 10 0
Second ,,	10 0 0	10 10 0
Third ,,	9 15 0	10 0 0
Fourth ,,	9 5 0	9 15 0
Oddments and battens at 20s., 10s., 7s. 6d., and 5s. less respectively.		
New Brunswick Spruce deals, &c.	9 15 0	11 0 0
Oddments, battens, and fourths	9 5 0	9 15 0
United States pitch pine planks and boards	11 10 0	16 0 0
Prepared Boards, per square		
1¼ by 6½ and 7 in. 1st yellow	11 0	16 0
,, ,, 2nd ,,	10 6	13 0
1 by 6½ and 7 in. 1st ,,	10 0	12 0
,, ,, ,, white	9 0	10 0
,, ,, 2nd yellow	9 0	11 0
,, ,, ,, white	8 0	9 0
¾ by 6½ & 7 in. 1st & 2nd yellow	7 9	9 0
,, ,, ,, white	7 6	8 6
¾ by 6½ and 7 in. 1st yellow and white (grooved, tongued, and beaded)	8 6	9 6
¾ by 6½ and 7 in. 2nd yellow and white (ditto)	7 6	8 6
¾ by 6½ and 7 in. 1st yellow and white (ditto)	6 6	7 6
¾ by 6½ and 7 in. 2nd yellow and white (ditto)	6 0	7 0
Narrower widths at 10 per cent. less.		
3rd quality at 15 per cent. less than 2nd.		
Danzig and Memel Fir Timber— per load		
Best middling	3 15 0	4 0 0
Good middling and Second	3 5 0	3 10 0
Common middling	3 0 0	3 5 0
Undersized	3 0 0	3 5 0
Swedish and Norwegian Balks	2 10 0	2 15 0
Baltic Oak Timber—		
Danzig and Stettin—Large	4 0 0	5 10 0
Small	3 5 0	4 0 0
Quebec Timber per load		
Yellow Pine	5 0 0	6 10 0
Oak	4 10 0	6 10 0
Elm	4 0 0	4 5 0
Ash	3 5 0	4 0 0
Birch	3 15 0	6 0 0

* The prices named are for the wood as imported and landed in the docks. Ten per cent., approximately, should be added in order to arrive at the current trade prices.

[*See also page 431.*

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered
*Church and Schools	Trustees	25*l.*; 15*l.*; 10*l.*	No date

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c., Supplied by	Tenders to be delivered
*Broken Granite	Romford R.D.C.	G. Lapwood, 19, North-street, Romford	April 30
Sewerage Works	Mountain Ash (Glam.) U.D.C.	J. Mansergh, Engineer, 5, Victoria-street, S.W.	May 1
Paving Works	Braintree (Essex) U.D.C.	H. H. Nankivell, Surveyor, Vestry Hall	do.
Street and Sewer Works	Govan (N.B.) Commissioners	F. G. Holmes, Civil Engineer, Hillock House, Govan	do.
Retort House, North Shields	Tynemouth Gas Company	W. Hardie, Engineer, Gasworks, North Shields	do.
Offices, Stapleton-road, Bristol	Great Western Railway Company	G. K. Mills, Paddington Station, W.	do.
Electricity Supply Works (Contract No. 11)	Southampton Corporation	Kincaid & Co., Engineers, 29, Great George-street, S.W.	do.
Sewage Filters, &c.	Barnsley Town Council	J. H. Taylor, Civil Engineer, Barnsley	do.
Additions to Farm House, near Modbury, Devon		Mr. Rogers, East Leigh Farm, Modbury	do.
Schools, Station-road	Morecambe School Board	J. B. Newton, Architect, Euston-road, Morecambe	do.
Gasworks Building	Poole Gas Company	W. Davis, Engineer, Gasworks, Poole	do.
Water Mains	Amble U.D.C.	W. Gibson, Surveyor, 31, Queen-street, Amble	do.
Cottage, Wickhamford		E. Grove, Architect, Littleworth-street, Evesham	do.
Fourteen Cottages, Castlecomer	Board of Works (Ireland)	W. Dobbs, Estate Offices, Castlecomer	do.
*Sewerage Works	Lathona and Burscough U.D.C.	J. T. Wood, Engineer, 3, Cook-street, Liverpool	do.
Passage Works	Litherland (Lancs.) U.D.C.	W. B. Garton, Surveyor, 25, Sefton-road, Litherland	May 2
Additions to Grammar School, Mirfield		J. L. Fox, Architect, Dewsbury	do.
Stores, Grimsthorpe	Sheffield Gas Company	J. W. Morrison, Engineer, Commercial-street, Sheffield	do.
Schools	Ramsey School Board	J. W. Start, Architect, Cups Chambers, Colchester	do.
Gas Engines, &c.	Ludlow Town Council	Pollard & Tingle, Engrs., 31, Old Queen-st., Westminster, S.W.	do.
Stables, Canton Market		W. Harpur, Civil Engineer, Town Hall, Cardiff	do.
Sewer, Leadgate	Lanchester R.D.C.	W. H. Ritson, Council Offices	do.
Public Hall, Walton-on-the-Naze		A. Migotti, Architect, 162, Brecknock-road, London, N.	do.
Paving Works	Trowbridge U.D.C.	F. E. G. Bradshaw, Surveyor, Town Hall	do.
House at Sewage Works, Dukinfield		Newton, Son, & Bayley, Engineers, 17, Cooper-street, Manchester	do.
*Wood Paving	Hampstead Vestry	Surveyor, Vestry Hall, Hampstead, N.W.	May 3
Rebuilding the Star Inn, Ashton Gate, near Bristol	Messrs. Hall & Sons	E. W. Barnes, Architect, Guildhall Chambers, Bristol	do.
Rebuilding the Lord Nelson Hotel, Darlington	Messrs. Allsopp & Sons, Limited	G. G. Hoskins, Architect, Darlington	do.
Reconstruction of Canal Bridge	West Bridgford (Notts.) U.D.C.	W. Pare, Civil Engineer, George-road, West Bridgford	do.
Four Purifiers, &c., at Gasworks	Smethwick Town Council	W. J. Sturges, Gas Offices, Town Hall	do.
House, Churwell, Yorks.	Mrs. G. S. Tetley	Buttery & Bird, Architects, Queen-street, Morley	do.
Business Premises, Bristol	Mr. E. Everard	H. Williams, Architect, 24, Clare-street, Bristol	do.
*Ambulance House	Bromley & Beckenham Jt. Hosp. Bd.	See Advertisement	May 4
Granite Road Metal (1,250 yards)	Ashford U.D.C.	W. Terrill, Surveyor, North-street, Ashford	do.
Shop, Bradford-road, Dewsbury	Mr. H. Squires	C. H. Marriott & Sons, Architects, West Park-street, Dewsbury	do.
Repairs at Workhouse	Abergavenny Union Guardians	W. H. P. Scanlon, Town Hall, Abergavenny	do.
Additions to Aspley Brewery, Huddersfield	Messrs. Bentley's, Limited	J. Berry, Architect, 9, Queen-street, Huddersfield	do.
House, Murthly (N.B.) Asylum	District Lunacy Board	D. Smart, Architect, Perth	do.
*Additions and Alterations, Griffin Hotel, Leeds	A. Fenwick	See Advertisement	May 5
Additions to Schools, Sudbury		W. M. Fawcett, Architect, Cambridge	do.
Chimney Shaft, &c., New-street	Middlesbrough Corporation	Borough Engineer, Municipal Buildings	do.
Alterations to Premises, Morpeth	Ashington Indus. Co-op. Soc., Ltd.	J. Magin, Newgate Street, Morpeth	do.
Sessional Court, &c., Wallsend	Northumberland County Council	J. Cresswell, County Architect, Newcastle	do.
Rebuilding Business Premises, Parliament-st. Kilkenny		J. F. Reade, Civil Engineer, John-street, Kilkenny	do.
Twenty-two Houses, Keighley		Barber & Company, Architects, Craven Bank-chambers, Kilkenny	do.
Chapel, Clydach, Wales		W. W. Williams, Architect, 63, Wind-street, Swansea	do.
Additions to the Anchor Inn, Buckie, N.B.	Mr. W. Mather	J. Perry, Architect, Buckie	do.
Club House, King Cross, Halifax	Working Men's Club & Institute	Walsh & Nicholas, Archt. Lancs. & Yorks. Bank-chmbrs., Halifax	May 7
Two Houses, Harrow	Land Company, Limited	V. Marsh, Civil Engineer, Hindes-road, Harrow	do.
Sewerage Works	Armagh U.D.C.	J. F. Peddie, C.E., 36, Scottish Provident Buildings, Belfast	do.
Light Railways	Barking U.D.C.	G. Barker, Engineer, 1, Victoria-street, S.W.	do.
Cemetery Works, Clinch Green	Bexhill U.D.C.	G. Ball, Civil Engineer, Town Hall	do.
Storage Tank at Sewage Farm, Sudbury Hill	Harrow U.D.C.	E. Lines, Engineer, High-street, Harrow	do.
*Paving Blocks	Camberwell Vestry	Engineer, Vestry Hall, Camberwell	do.
*Road Material	Lewisham Board of Works	Surveyor's Department, Town Hall, Catford, E.	May 8
Foundation Works, Chalvey	Slough U.D.C.	W. W. Cooper, Surveyor, 1, Mackenzie-street, Slough	do.
Forty Cottages, Miles Platting	Manchester Corporation	City Surveyor, Town Hall	do.
School	Barking School Board	C. J. Dawson, Architect, Barking	do.
Light Railway, Wick, N.B.	Highland Railway Company	W. Roberts, Engineer, Inverness	do.
*Making-up Roads	Tottenham U.D.C.	P. E. Murphy, 712, High-road, Tottenham	do.
Additions to Municipal Offices, Bacup-road	Rawtenstall Corporation	A. W. Lawson, Civil Engineer, Municipal Office	May 9
Surveyor's Materials, Ormskirk	West Lancashire R.D.C.	C. Law-Green, Civil Engineer, 50, Hampton-road, Southport	do.
Fire Station, Market-street	Bingley U.D.C.	W. R. Nunns, Architect, Market-street, Bingley	May 10
*Church Hall	Bettws-y-Cwyn (Salop) School Bd.	C. J. Mann & Son, 29, Great George-street, Westminster	May 12
Additions to Schools	Committee	R. Parry, Architect, Lydbury North	do.
Lecture Hall, Saintfield, co. Down, Ireland	Leominster Corporation	H. Hobart, Architect, Dromore, co. Down	do.
*Storage Reservoir	Romsey Union	Borough Surveyor, Town Hall, Leominster	do.
*Workhouse Infirmary	Hornsey U.D.C.	J. Jenvey, Architect, Market Place, Romsey	do.
*Sewering, Levelling, Paving, &c.	H.M. Office of Works	Engineer, Council's Offices, Southwood-lane, Highgate, N.	May 14
*Alterations and Additions at the Royal Mint	Eastry R.D.C.	Westcott, Office of Works, Storey's Gate, S.W.	do.
*Sanatorium	Long Cvendon R.D.C.	W. J. Jennings, Architect, 4, St. Margaret's-street, Canterbury	do.
*Stoneware Sewers	Levenshulme U.D.C.	J. Taylor, Sons, & Santo Crimp, 27, Great George-st., Westminster	do.
Bandstand and Shelter	Paddington Vestry	Jas. Jepson, Surveyor, Tiviot Dale, Stockport	do.
Wood Paving Works	do.	Surveyor, Vestry Hall, Harrow-road, W.	do.
*Wood Blocks	Cromer U.D.C.	do.	do.
*Isolation Hospital	Brentford U.D.C.	A. F. Scott, Surveyor, Church-street, Cromer	do.
Granite	Shoreditch Vestry	Nowell Parr, Clifden House, Boston-road, Brentford	May 15
*Wood Paving	Wimbledon U.D.C.	Surveyor, Town Hall, Old-street, E.C.	do.
*Electricity Generating Station	Birmingham School Board	Surveyor, Council's Offices, The Broadway, Wimbledon	do.
Schools, Station-road, Harborne	Brentford U.D.C.	Martin & Martin, Architects, 106, Colemore-row, Birmingham	do.
*Workmen's Dwellings	St. Olaves Union	Nowell Parr, Clifden House, Boston-road, Brentford	do.
*Painting, Cleaning, &c.	Glasgow Corporation	Newman & Newman, 31, Tooley-street, S.E.	May 17
*Street Paving Stones	Norman Cross R.D.C.	Master of Works, City Chambers, Glasgow	do.
Sewerage Works, Fletton	Walthamstow School Board	G. & F. W. Hodson, Engineers, Loughborough	May 18
*School	West Ham School Board	W. A. Longmore, Architect, 7, Great Alie-street, E.	May 22
*Cleansing, Repair, and Painting of Schools	Littleborough U.D.C.	W. Jacques, 2, Fen-court, E.C.	do.
Sewers	Mr. J. G. Scott	G. H. Wild, Surveyor, Littleborough	No date
Villa, Colinton, N.B.	Mr. J. Laxon	E. C. H. Maidman, Architect, 13, South Charlotte-st., Edinburgh	do.
Business Premises, Cross Cheaping	Messrs. J. Smith	G. and T. Steane, Architects, 22, Little Park-street, Coventry	do.
Chimney at Brewery, Tadcaster		Bromet & Thorman, Architects, Tadcaster	do.
Chapel, Openshaw, Manchester	Mr. H. L. Dampier	Potts, Son, & Hennings, Archt., 34, Victoria-bldgs., Manchester	do.
Nine Houses, Goddington-road, Strood		W. Banks, Architect, 5, Theobald-square, Rochester	do.
Two Houses, Chapeltown, near Sheffield		J. Trippett, High Green House, Chapeltown	do.
Chapel, Heathersgill, near Carlisle		Oliver & Dodgshun, Architects, Carlisle	do.

[*See also next page.*

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*Architectural Assistant	London County Council	230*l.* per annum	May 7
*Borough Engineer and Surveyor	Grimsby Town Council	400*l.* per annum, increasing to 500*l.*	May 8
*General Engineering Draughtsman	Salford Corporation	... ...	do.
*Clerk of Works	Lydney R.D.C.	.....	May 9
*Architectural Assistant	Plumstead Vestry	.....	No date

Those marked with an asterisk (*) are advertised in this Number. *Competitions, p. iv. Contracts, pp. iv. vi. viii. x. xii. & xxiv Public Appointments, pp. xxi. & xxiv.*

PRICES CURRENT (*Continued*).

	£ s. d.	£ s. d.
New Brunswick, &c., Birch	3 10 0	4 5 0
American Pitch Pine Timber	3 17 6	4 17 6
Wainscot, per log, 18 cubic ft —		
Crown (Eng. & Dutch) } nominal	3 15 0	4 17 6
Brack } nominal	3 0 0	4 0 0
Lathwood, per cubic fathom—		
Petersburg	4 2 0	6 10 0
Riga and Danzig	4 10 0	5 10 0
Norway Poles, per ft. run	0 0 1	0 0 1½
Oak Staves, per mille full size pipe		
Memel, Crown	220 0 0	230 0 0
Brack	190 0 0	200 0 0
Danzig	165 0 0	175 0 0
Bosnia, single Barrel (nominal)	28 0 0	30 0 0
United States, Pipe	37 10 0	45 0 0
Hogshead, extra heavy and double extra	30 0 0	35 0 0
Indian Teake per load	11 10 0	16 10 0
British Guiana Greenheart	0 0 0	8 0 0
Mahogany, per foot superficial—		
Honduras, cargo average	0 0 4½	0 0 5½
Nicaragua, do.	0 0 4½	0 0 5½
Tabasco, do.	0 0 4½	0 0 6
Mexican, do.	0 0 4	0 0 4½
Panama, do.	0 0 3½	0 0 4
African, do.	0 0 3¾	0 0 4
Cuba, do.	0 0 6	0 0 8
St. Domingo, do.	0 0 5	0 0 7½
Do. Curls (good to prime)	0 0 9	0 1 3
Walnut, American (logs)	0 3 0	0 5 0
Do. do. (planks and boards)	0 2 0	0 7 6
Italian, per foot superficial	0 0 3	0 0 7½
Black Sea, per ton	6 0 0	12 0 0
Satin Walnut (logs) per foot cube	0 1 0	0 1 6
,, (planks and boards)	0 1 9	0 3 0
Sequoia (Californian redwood), per foot cube	0 1 9	0 2 0
Whitewood, American (logs)	0 1 4	0 1 9
,, ,, (planks and boards)	0 1 9	0 2 9
Quartered oak ,, ,, ,,	0 2 3	0 4 0
Kauri pine (logs)	0 1 9	0 2 0
,, (planks)	0 2 3	0 2 9
Jarrah (planks)	0 2 0	0 2 3
Lancewood spars each, fresh and large	0 5 0	0 7 0
Lancewood spars, ordinary to fair	0 3 0	0 4 0
Degame spars	0 8 0	0 10 0

METALS.

IRON—Pig, in Scotland ton	3 14 2½	0 0 0	
Bar, Welsh, in London	9 0 0	9 15 0	
Do. do. at works in Wales	8 10 0	9 0 0	
Do. Staffordshire, in London	9 15 0	11 15 0	
COPPER—British cake and ingot	80 0 0	81 0 0	
Best selected	80 10 0	82 0 0	
Sheets, strong	88 0 0	90 0 0	
Chili bars	77 10 0	77 15 0	
YELLOW METAL lb.	6¾d.	7d.	
LEAD—Pig			
Spanish ton	16 18 9	0 0 0	
English Com. Brands	17 6 3	0 0 0	
Sheet, English, 6 lbs. per sq. ft. and upwards			
Pipe	18 16 3	0 0 0	
ZINC—English sheet ton	19 6 3	0 0 0	
Vieille Montagne	26 10 0	0 0 0	
Spelter	28 10 0	0 0 0	
TIN—Straits	22 10 0	22 12 6	
Australian	137 0 0	0 0 0	
English Ingots	138 10 0	139 0 0	
Banca	141 0 0	142 0 0	
Billiton	0 0 0	0 0 0	

ENGLISH SHEET GLASS IN CRATES.

15 oz. thirds	2½d. per ft. delivered.
,, fourths	2d. ,, ,,
21 oz. thirds	3d. ,, ,,
,, ,, fourths	2¾d. ,, ,,
26 oz thirds	4d. ,, ,,
,, ,, fourths	3½d. ,, ,,
32 oz. thirds	5d. ,, ,,
,, ,, fourths	4½d. ,, ,,
Fluted sheet, 15 oz.	2½d. ,, ,,
,, ,, 21 ,,	3½d. ,, ,,

OILS, &c.

Raw Linseed Oil in pipes, per ton	26 10 0	0 0 0
,, ,, in drums, per gal.	0 2 4	0 0 0
Boiled ,, ,, in pipes, per ton	28 10 0	0 0 0
,, ,, in drums, per gal.	0 2 6	0 0 0
TAR—Stockholm barrel	1 6 6	0 0 0
Archangel	1 0 0	0 0 0
Turpentine, in barrels, per cwt.	2 2 0	0 0 0
,, in drums, per gal.	0 3 4	0 0 0
Genuine Ground English White Lead	25 10 0	0 0 0
Red Lead	22 0 0	0 0 0
Best Linseed Oil Putty, per cwt.	0 8 0	0 0 0

PRICES CURRENT (*Continued*).

VARNISHES, &c.

	per gallon.
Fine Elastic Copal Varnish for outside work	0 16 0
Best Elastic Copal Varnish for outside work	1 0 0
Best Elastic Carriage Varnish for outside work	0 16 0
Best Hard Oak Varnish for inside work	0 16 0
Best Extra Hard Church Oak Varnish for inside work	0 10 0
Fine Hard Copal Varnish for inside work	0 10 0
Best Hard Copal Varnish for inside work	0 16 0
Best Hard Carriage Varnish for inside work	1 0 0
Extra Pale Paper Varnish	0 16 0
Best Japan Gold Size	0 12 0
Best Black Japan	0 10 0
Oak and Mahogany Stain	0 16 0
Brunswick Black	0 8 0
Berlin Black	0 8 0
Knotting	0 15 6
Best French and Brush Polish	0 9 0
	0 8 6

BRICKS, &c.

	s. d.	
Hard Stocks	30 0	per thousand alongside, in river.
Rough Stocks and Grizzles	28 0	,, ,, ,, ,,
Smooth Bright Facing Stocks	58 0	,, ,, ,, ,,
Shippers	42 0	,, ,, ,, ,,
Flettons	29 0	,, ,, ,, ,,
Red Wire Cuts	34 0	,, ,, at railway depôt.
Best Fareham Red	71 6	,, ,, ,, ,,
Best Blue Pressed Staffordshire	86 0	,, ,, ,, ,,
Best Stourbridge Fire Bricks	84 0	,, ,, ,, ,,
Best White Glazed Stretchers	260 0	,, ,, ,, ,,
Headers	240 0	,, ,, ,, ,,
Quoins and Bullnose	340 0	,, ,, ,, ,,
Double Headers	320 0	,, ,, ,, ,,
Best Dipped Salt Glazed Stretchers and Headers	240 0	,, ,, ,, ,,
Quoins and Bullnose	280 0	,, ,, ,, ,,
Double Headers	280 0	per thousand at railway depôt.
Seconds Quality White and Dipped Salt Glazed	40 0	per thousand less than best.
Thames and Pit Sand	7 0	per yard, delivered
Thames Ballast	6 6	,,
Best Portland Cement	34 0	per ton ,,
Best Ground Blue Lias Lime	23 0	,, ,,

NOTE.—The cement and lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 12s. 0d. per yard, delivered.
Stourbridge Fire-clay in sacks, 31s. 6d. per ton at rly. dpt.

STONE.

	s. d.	
Ancaster in blocks	2 0	per ft. cube, deld. rly. depôt
Bath ,,	1 7	,, ,,
Beer ,,	1 6½	,, ,,
Grinshill ,,	1 10	,, ,,
Brown Portland in blocks	2 2	,, ,,
Darley Dale ,,	2 1½	,, ,,
Red Corsehill ,,	2 5	,, ,,
Red Mansfield ,,	2 4½	,, ,,
Hard York ,,	2 10	,, ,,
Hard York 6 in. sawn both sides landings, to sizes (under 40 ft. sup.)	2 7	per ft. super. at rly. depôt.
,, ,, 6 in. Rubbed Ditto	2 10½	,, ,,
,, ,, 3 in. sawn both sides slabs (random sizes)	1 3	,, ,,
,, ,, 3 in. self-faced Ditto	0 9	,, ,,

SLATES.

in. in.	£ s. d.	
20×10 best blue Bangor	11 5 0	per 1000 of 1200 at rly. dep.
,, best seconds ,,	10 15 0	,, ,,
16×8 best ,,	6 2 6	,, ,,
20×10 best blue Portmadoc	10 18 0	,, ,,
16×8 ,, ,,	6 0 0	,, ,,
20×10 best Eureka unfading green	11 2 6	,, ,,
16×8 ,, ,,	6 15 0	,, ,,
20×10 Permanent green and Sedan green	10 0 0	,, ,,
16×8 ,, ,,	5 12 6	,, ,,

TILES.

	s. d.	
Best plain red roofing tiles	40 6	per 1,000 at rly. depôt.
Hip and valley tiles	3 6	per doz.
Best Broseley tiles	47 6	per 1,000 ,, ,,
Hip and valley tiles	4 0	per doz. ,, ,,

TO CORRESPONDENTS.

J. W. B.—J. B.—V. W. L. (Amounts should have been stated).

NOTE.—The responsibility of signed articles, letters, and papers read at meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article is given subject to the approval of the article, when written, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 10 a.m. on Thursdays.* N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

AMMANFORD.—For the erection of a chapel, Cape, Hendre. Mr. J. W. Jones, architect, Gwily House Llandilo :—

Henry Thomas	£1,627 9	Wm. Evans	£1,417 0
Brown, Thomas & John	1,590 0	David Thomas	1,397 0
John Howells	1,588 0	John H. Vaughan, Pantyffynnon*	1,360 0
Lewis Daves	1,560 0	George Vaughan	1,280 0

BARNSLEY.—For the erection of workmen's institute, house, &c., Hoyland Common. Mr. W. J. Sykes, architect, Hoyland, near Barnsley :—

Bricklaying, &c.

A. Hemingway, Hoyland Common, near Barnsley £908 17 0

Carpentering and Joinery.

H. Brearley, Hoyland Common, near Barnsley 525 13 8

Slating and Plastering.

M. Fleming, Eastgate, Barnsley 194 10 0

Painting, &c.

W. H. Rawlin, Hoyland Nether, near Barnsley 86 9 0

£1,715 9 8

CRUMLIN (Mon.).—For additions to schools for the Mynyddislwyn School Board. Mr. R. L. Roberts, architect, Abercarn. Quantities by the architect :—
C. F. Morgan, Newbridge* £410

HAVERFORDWEST.—For the erection of a minister's residence, High-street, Solva. Mr. D. E Thomas, architect, Haverfordwest.
Wm. Morgan, Penycwm, R.S.O. (Pem.)* .. £395

HINDHEAD (Surrey).—For the works required in the alterations and additions to Blen-Cathra, Hindhead, Surrey, for the Rev. W. Richmond. Messrs. Newman & Newman, architects and surveyors, 31, Tooley-street, S.E. Quantities by Messrs. Selby & Saunders, 39, Victoria-street, Westminster :—

	School.	Chapel.	Dining Hall.	Total.
Balaam Bros.	£7,909	£683	£625	£9,217
Samuel Page	6,699	719	584	8,002
J. A. Hunt	6,409	585	610	7,604
Chapman & Lowry	6,056	583	520	7,159
Botterill & Sons	5,483	498	492	6,473
Holloway Bros.	5,430	505	465	6,400
Tompsett & Co., Farnham‡	5,345	470	450	6,265
Hutchinson	5,310	495	456	6,261

‡ Amended tender accepted, 6,253*l.* 8*s.* 9*d.*

[*See also next page.*

LANCASTER. — For the erection of bakery and laundry at the workhouse. Mr. J. Parkinson, architect :—

Masonry.—H. W. Stoneham*	£1,688 16 6
Joinery.—E. Thompson*	493 8 6
Slating.—T. & J. Till*	228 3 0
Plumbing.—Whittle & Wilcock*	296 0 0
Painting.—J. Taylor*	59 8 9
Ovens.—A. Cornthwaite*	140 0 0

[All of Lancaster.]

LIMPSFIELD.—For infants' home at Limpsfield, for the Church Missionary Society. Mr. John Norton, architect. Quantities by Mr. S. J. Thacker :—

Alfred Bush	£6,298	Thos. Boyce	£6,081
Perry & Co.	6,141	Lawrance & Sons*	5,985

LLANDONNA (WALES).—For the construction of sea-wall, flood gates, &c., Wern, Red Wharf Bay. Mr. Joseph Owen, architect, Menai Bridge.

J. K. Baker	£2,978 15 0	Parry, Menai Bridge*	£1,457 0 0
John Griffith	2,500 0 0		
Jones Bros.	1,469 0 0		

LONDON.—For erecting stables and van-shed building, Grange-road, Bermondsey, for Mr. Samuel Taylor. Messrs. Newman & Newman, architects, 31, Tooley-street.

G. Parker	£1,778
Wells & Son*	1,565

LONDON.—For new stores, for the Electrical Power Storage Company, Limited, at Millwall. Mr. Alfred Roberts, architect, 18, Nelson-street, Greenwich, S.E. :—

Bulled & Co.	£1,075	Jerrard & Sons	£789
W. Mills	919	T. D. Leng	745
Watts, Johnston, & Co.	793	H. Groves	739
		W. Martin*	712

LONDON.—For the erection of shop premises and stabling at Ilford, E. Messrs. Foulsham & Herbert Riches, architects, Bromley-by-Bow, E., and 3, Crooked-lane, King William-street, E.C. :—

Todd & Co.	£3,580	J. & H. Cocks	£3,560
Osborn & Sons	3,569	Sheffield Bros.*	3,393
Dearing & Son	3,565		

LONDON.—For the construction of an underground convenience, Gibb's Green, Fulham, for the Fulham Vestry. Mr. C. Botterill, C.E., Town Hall, Walham Green :—

	Newellite.	Glazed bricks.
Geo. Jennings, Lambeth	£2,250	£2,250
W. Pearce, Thornton Heath	1,950	2,000
Finch & Co., Lambeth	1,938	2,058
Doulton & Co., Lambeth	1,932	2,070

LONDON.—For the erection of branch premises for the London and Provincial Bank. Mr. Alfred Roberts, architect, 18, Nelson-street, Greenwich, S.E. :—

E. Proctor	£3,740	G. F. Havell	£3,150
J. & A. Oldman	3,525	S. J. Jerrard & Sons	3,087
G. Simmonds & Sons	3,520	H. Groves*	3,020
W. Mills	3,395		

MARYPORT.—For alterations, &c., to "Golden Lion" hotel, for Sir Geo. Hodgson & Co., Limited (Carlisle Old Brewery). Mr. H. Higginson, architect, Carlisle. Quantities by the architect :—

Thomas Mandle, South Quay, Maryport* .. £1,450 16

MENAI BRIDGE (N. Wales).—For the erection of schools and residence, Llanrhyddlad, Anglesey. Mr. Joseph Owen, architect, Menai Bridge :—

John Griffith	£2,004 0	Wm. Pritchard	£1,398 15
J. & R. Evans	1,575 0	Hugh Williams, Llanrhyddlad*	1,390 0

MIDDLESBROUGH.—For the erection of Ayresome Schools, accommodation 1,270 children, with caretaker's house, for the School Board. Mr J. Mitchell Bottomley, architect, 28, Albert-road, Middlesbrough :—

Leeder & Son	£18,253 1 1	W. Pounder	£15,721 15 4
S. Coates	16,918 8 1	G. Scales	15,694 0 0
Executors J. Johnson	16,264 0 0	Allison Bros., Middlesbro'*	14,724 0 0
W. A. King	15,993 3 7		

ROYDON.—For detached residence, to be erected for Mr. F. Bull, at Roydon, Essex. Mr. F. Child, surveyor, 65 and 66, Chancery-lane, W.C. :—

		Extra for hollow walls.
Fred. Britton	£1,800 0 0	£45 0 0
Wells & Sons	1,092 0 0	80 0 0
Ekins & Co.	1,050 0 0	140 0 0
Glassock & Son	1,008 0 0	not given
F. Hitch	949 0 0	110 10 0

SWINDON.—For the erection of a church, Redbourne-road. Messrs. Drew & Sons, architects, Victoria-street, New Swindon :—

A. J. Colborne	£1,319 17 4	Pydeman Bros.	£1,170 0 0
C. Wickins	1,249 5 0	R. J. Leighfield*	1,151 0 0
J. Williams	1,217 0 0		

[All of Swindon.]

SWINDON.—For forming roads, laying in sewers, &c., on the Even Swindon Estate, for Mr. J. Morrison, J.P. Messrs. Wm Drew & Sons, surveyors, Swindon. Quantities by the surveyors :—

J. Williams, Swindon* £1,655

TERMS OF SUBSCRIPTION.

"THE BUILDER" (Published Weekly) is supplied DIRECT from the Office to residents in any part of the United Kingdom, at the rate of 19s. per annum (52 numbers) PREPAID. To all part sof Europe, America, Australia, New Zealand, India, China, Ceylon, &c., 26s. per annum. Remittances (payable to DOUGLAS FOURDRINIER) should be addressed to the publisher of "THE BUILDER," No. 46, Catherine-street, W.C.

SUBSCRIBERS in LONDON and the SUBURBS, by prepaying at the Publishing Office, 19s. per annum (52 numbers) or 4s. 9d. per quarter (13 numbers), can ensure receiving "The Builder," by *Friday Morning's Post*.

THE BATH STONE FIRMS, Ltd.
BATH.
FOR ALL THE PROVED KINDS OF
BATH STONE.
FLUATE, for Hardening, Waterproofing, and Preserving Building Materials.

HAM HILL STONE.
DOULTING STONE.
The Ham Hill and Doulting Stone Co.
(Incorporating The Ham Hill Stone Co. and C. Trask & Son The Doulting Stone Co.)
Chief Office :—Norton, Stoke-under-Ham, Somerset.
London Agent :—Mr. E. A. Williams, 16, Craven-street, Strand.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 42, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. Asphalte Contractors to the Forth Bridge Co. [ADVT.

SPRAGUE & CO., Ltd.,
LITHOGRAPHERS AND PRINTERS.
Estate Plans and Particulars of Sale promptly executed.
4 & 5, East Harding-st., Fetter-lane, E.C. [ADVT.

QUANTITIES, &c., LITHOGRAPHED accurately and with despatch.
METCHIM & SON { 8, PRINCES STREET, ST. GEORGE ST. WESTMINSTER
"QUANTITY SURVEYORS' DIARY AND TABLES, For 1900, price 6d. post 7d. In leather 1/- Post 1/1 [ADVT.

DRY PLANKS AND BOARDS
In all kinds of Hard Woods.
Mahogany, Wainscot, Teak, &c. &c.
Wm. MALLINSON & Co.
Offices: 136 & 138, Hackney Road, London, N.E.
Telephone: 1319 AVENUE.

J. J. ETRIDGE, Jr.
SLATE MERCHANT,
SLATER and TILER.
Penrhyn - Bangor,
Oakeley - Portmadoc,
And every other description of Slates, except American, Ready for immediate delivery to any Railway Station.
NORMAN CROSS
FIRST QUALITY
FLETTON BRICKS.
Applications for Prices, &c., to
BETHNAL GREEN SLATE WORKS,
BETHNAL GREEN, LONDON, E.

ASPHALTE
For Horizontal & Vertical Damp Courses.
For Flat Roofs, Basements, & other Floors.
Special attention is given to the above by
THE
French Asphalte Co.
Contractors to
H.M. Office of Works, The School Board for London, &c.
For estimates, quotations, and all information, apply at the Offices of the Company,
5, LAURENCE POUNTNEY HILL,
CANNON STREET, E.C.

C. B. N. SNEWIN
MAHOGANY, WAINSCOT, WALNUT,
TEAK, VENEER, and TIMBER MERCHANT,
Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, & 17, BACK HILL, HATTON GARDEN, and 29, RAY STREET, FARRINGDON ROAD, E.C.
THE LARGEST STOCK OF ALL KINDS OF WOODS IN EVERY THICKNESS, DRY, AND FIT FOR IMMEDIATE USE.
Telephone, No. 276 Holborn. Tele. Address: "SNEWIN: London."

TWELVE GOLD AND SILVER MEDALS AWARDED.
COPPER AND ZINC ROOFING.
F. BRABY & CO.

LONDON.	LIVERPOOL.	GLASGOW.	BRISTOL.
352 to 364, Euston-rd., N.W.	6 & 8, Hatton Garden.	47 & 49, St. Enoch-square.	Ashton Gate Works, Coronation-rd

VIEILLE MONTAGNE SOLE MANUFACTURING AGENTS.
NO SOLDER. NO EXTERNAL FASTENINGS.
Particulars on Application. *Chief Offices: Fitzroy Works, EUSTON ROAD, LONDON, N.W.*